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HOWARD C. WARREN, PRINCETON UNIVERSITY (*Review*)
JOHN B. WATSON, JOHNS HOPKINS UNIVERSITY (*J. of Exp. Psychol.*)
SHEPHERD I. FRANZ, GOVT. HOSP. FOR INSANE (*Bulletin*) and
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TABLE OF CONTENTS OF VOL. XXIII

(This volume includes Monographs 98-101.)

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The opportunity for making this application of psychological methods is due to the cooperation of Professor Leon C. Marshall, Dean of the College of Commerce and Administration of The University of Chicago. Mention of this fact is hardly necessary so patent is his connection at every point. To him the author owes more than can publicly be acknowledged. Thanks are specifically rendered for all the facilities which he unstintedly furnished for the researches of the past two years, but most gratitude is felt for his live enthusiasm and interest which have been powerful incentives at every stage of the work. At discouraging moments, when technical difficulties seemed almost unsurmountable, his unshaken confidence in the possibilities of the method and his happy combination of the common-sense and the scientific attitudes gave inspiration for renewed exertions. The author feels highly honored in being privileged to work with so intrepid an educator.

Thanks are gratefully rendered to Miss Marie Spalding of the office force of the College of Commerce and Administration who assisted throughout the entire two years. To her intelligent service is due much of the reliability which can be credited to the results.

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was enjoyed by this research. But in this case there was added the interest of an educator, for Professor Angell, by virtue of his position as Dean of the Faculties in the university maintained keen interest in the practical outcome of the study, and his advice from an educational point of view has thus been an additional aid.

TABLE OF CONTENTS

CHAPTER I

The Ideal of Individualized Instruction

"To-day the professor's energy is practically exhausted in his study of the subject which he is to present to the student. In the time that is coming provision must be made, either by the regular instructors or by those appointed especially for the purpose, to study in detail the man or woman to whom instruction is offered. Just as at present, in many institutions, every student upon entrance receives a careful physical examination, for the discovery of possible weaknesses, and for the provision of special corrective exercises: . . . so in the future it will be a regular function of the college to make a general diagnosis of each student.

This will be made (1) with special reference to his character—to find out whether he is responsible, or careless, or shiftless, or perhaps vicious; (2) with special reference likewise to his intellectual capacity—to discover whether he is unusually able, or bright, or average, or slow, or dull; whether he is industrious, or irregular, or lazy; (3) with reference to his special intellectual characteristics—to learn whether he is independent and original, or one who works largely along routine lines; whether his ideas are flexible or easily diverted or rigid; whether he has control of his mind or is given to mind-wandering, and to what extent he has power to overcome difficulties; (4) with reference to his special capacities and tastes—to determine whether these are evenly balanced or whether there exists a marked preference for some special subject; whether he prefers those aspects of study which are of the book type or those of a mechanical or constructive type or those of a laboratory type; whether his special gift lies along lines of an aesthetic character or those of a literary or scientific or philosophical character; whether his special aptitude, supposing it to be in the literary field, lies in criticism or interpretation or creative work . . . and finally, (5) with reference

to the social side of his nature—to judge whether he is fond of companionship; whether he is a leader or follower among his fellows; whether he is a man of affairs or devotes himself exclusively to his studies; the character of his recreations the way in which he spends his leisure hours; whether he is compelled to work for self-support or for the support of others. . . .

Such a diagnosis, when made, would serve as the basis for the selection of studies. . . .

The data thus gathered will determine the character of the advice given for the student, and of any punishment administered. . . .

This material likewise, will determine largely the career of the student. . . .

This feature of twentieth-century college education will come to be regarded as of greatest importance, and fifty years hence will prevail as widely as it is now lacking."[1]

In the decade that has elapsed since President Harper outlined the foregoing program, the demand has become even more insistent that university education be made a matter for individual adjustment. College and university authorities are awaking to a realization of the fact that they know very little about the individuals committed to their care. The student brings to the institution a preparatory record consisting of grades which represent roughly certain attainments in various academic lines. These grades, vague and unstandardized, constitute practically the only measure of the student at time of entrance. Even after four years of contact with the student, the institution has gained little by way of adequate measures of his ability. The records show a certain number of marks, which represent degrees of success in various branches of the curriculum. These markings usually indicate the number of facts the student has been able to acquire and retain until examination time. But the particular aptitudes for professional and social life which he possesses are practically undetermined. Moreover the institution lacks the power to measure the effect of its own training upon the student. It is

[1] William Rainey Harper, The Trend in Higher Education, Univ. of Chicago Press, 1905, p. 321 ff.

generally believed that academic training effects a general increase in mental power. It is assumed that four years of college discipline have a pronouncedly beneficial effect upon memory processes, reasoning ability, habits of concentration, etc. The validity of this assumption remains questioned, however, because such general developmental effect has not been objectively determined and subjected to measurement.

The rapidly evolving ideals of twentieth-century education are bringing to light another responsibility that rests upon college and university administrators. Academic failures of students must be recognized as necessary subjects for investigation. The tendency of the past has been to accept the academic "cripples" rather ungraciously as necessary phenomena of the normal curve of distribution or else summarily to dismiss them on a general charge of incompetency. An awakening conscience, however, is prompting a new attitude toward these academic weaklings—a recognition of the obligation to study the individual in order to determine the cause of his deficiencies and then to apply remedial measures. So long as an institution accepts and retains a deficient student as a matriculant it owes him not merely low grades but special efforts looking toward their elimination.

The needs of the better-than-average student are also being seen in a clearer light. Institutions of learning are coming to see that special capacity deserves special opportunity and the establishment of "honor courses" represents the recognition of the obligation to adapt instruction to individual needs.

An attempt has been made at The University of Chicago to establish a method of studying the student, and although the aim is imperfectly realized the results have shown the practicability of the ideal. The innovations have been confined to the College of Commerce and Administration where for several years Dean L. C. Marshall has been promoting a method of individualized instruction. As at present organized, it involves the following features:

1. The enrollment of the college is kept small—about 200—so that close personal relations may be maintained between student and dean.

2. Supervision of each student's course of study is insured by the regulation that the entire thirty-six undergraduate majors must be chosen with the approval of the dean.

3. The effort is made to have a long interview with each person that applies for admission to the college. The aims of this interview are (a) to make certain that the college can serve this individual, (b) to make certain that the individual understands and appreciates the requirements of the college.

4. Upon admission each student fills out (a) a life-history blank, (b) a personal record blank.

5. Inquiries are sent to high school teachers for information concerning the student.

6. Inquiries are sent to former employers for information concerning the student.

7. A printed form and a personal letter are sent to parents requesting information and cooperation.

8. The gymnasium director furnishes any significant facts which appear in the physical examination.

9. At the opening of the autumn quarter a series of freshmen conferences are conducted by the writer on the psychology and physiology of study.

10. At the end of each quarter, instructors are asked to turn in suggestions and criticisms concerning the students in their classes.

11. In addition to the close supervision over class-room work which prevails in The University of Chicago at large, advisory relations are also maintained over the non-scholastic activities of the student. At the opening of every quarter, each student fills out a blank indicating the activities and obligations he is assuming over and above the work incidental to his studies.

12. The Daily Maroon (the university newspaper) is watched and record made in the office, of the social and athletic activities of students in this college.

13. The final feature of the plan is a system of psychological examinations carried on by the writer throughout the past two years.

It is evident that the corner-stone of this plan is that the

course of each student is given individual consideration by the dean and is chosen with reference to a large mass of information he has on file. This information is from widely different sources and covers the entire range of the student's activities. It is not to be expected that all this information gives one hundred per-cent of reliability. Some of the replies to the inquiries, for example, give varying reports. This is to be expected. They are obviously based upon different degrees of acquaintance and they necessarily reflect different points of view. On the whole, however, it is found that a fair degree of reliability can be attached to these reports. For example, if several persons who are competent to judge, report that a student is inclined to inactivity, one has rather good grounds for concluding that the information is correct. Experience has proved these judgments reliable in so many cases that their helpfulness is quite well established. Samples of blanks are here appended showing the manner in which the data are obtained. Their purpose will be clear without further explanation.

The mental aspect of the student is a matter for psychological investigation. Therefore in 1913 a system of psychological examinations was introduced, and the remainder of this work will consist of a description of this system and a report of results.

The University of Chicago

The College of Commerce and Administration

Please state your estimate of this student and return the card to the Dean of the College of Commerce and Administration. The information will be considered confidential. It will be quite satisfactory to have this estimate stated as answers to the following questions or in any other form which you may find better adapted to the needs of the case.

Name of student_____
No. Dept. Title

Course _____

Taken_____ Instructor_____

1. In what particulars do you consider this student strong?

(OVER)

2. In what particulars do you consider this student weak?

3. Have you any other information or suggestions growing out of your experience with this student which will be helpful in shaping his curriculum?

(OVER)

The University of Chicago

The College of Commerce and Administration

This card is designed to indicate some of the qualities more frequently commented upon. It is not expected, of course, that information will be given upon all points mentioned.

Ability to grasp general principles, Ability to master details, Ability to express thoughts, Alertness, Keenness, Thoroughness, System, Open-mindedness, Initiative, Judgment, Reliability, Industry, Self-reliance, Regard for duty, Moral influence among fellows, Poise, Manner, Ability to handle people, Fondness for sports, Interest in people, Outlook on life, Popularity.

ACTIVITIES SHEET

TRY TO ANSWER EVERY QUESTION IN SPECIFIC TERMS

DO NOT WRITE ABOVE THIS LINE

Quarter_____ Name_____

How many hours per week do you expect to work in self-support this quarter?_____

In what kind of work?_____

How many hours per week did you spend in self-support your last quarter of residence?_____

In what kind of work?_____ Total remuneration for quarter_____

Underscore the statement which in your judgment best expresses the amount you contributed to your support (including college expenses) last quarter:
All———somewhere between one-half and all———some, but less than one-half———none.

In case you are returning after three or more months' absence, or are entering the University, have you been working?_____

If so, at what?_____ Rate of pay per week_____

Name of employer_____ His address_____

Have you home duties which interfere with your college work?_____ If so, how many hours per week?_____

How much time do you consume daily in getting to and from the University?_____ (In case this is negligible, do not answer the question)

In what student activities did you engage during your last quarter of residence? (Include clubs, fraternities, etc.)_____

In what student activities do you expect to engage this quarter?_____

The University of Chicago

The College of Commerce and Administration

PERSONAL RECORD

THE STUDENT WILL PLEASE FILL THIS BLANK IN HIS OWN HANDWRITING

ADDITIONAL INFORMATION ON ANY OF THE POINTS MAY BE GIVEN ON THE BACK OF THE SHEET

Date_____

Date and place of birth _____ Name _____

Name of parent or guardian _____ Permanent address _____

Business of parent or guardian _____

Businesses owned by near relatives:

NAME OF BUSINESS FIRM	PLACE	KIND OF BUSINESS	NAME OF RELATIVE

Names and addresses of high-school teachers who know you best. (Advanced standing students may use names of college teachers.)

NAME	PRESENT ADDRESS

Business or professional experience:

YEAR	WHAT	PAY	NAME OF EMPLOYER	ADDRESS OF EMPLOYER

Names and addresses of other persons who know you best:

NAME	PRESENT ADDRESS

Extent of self-support
Before coming to college _____ During college year _____ Summer vacations _____

Height _____ Weight _____

Health _____

Number of brothers or sisters _____

Married or single? _____ Family if married _____

Tobacco? _____ In what form? _____

Drink? _____

Out-of-door sports _____

Favorite amusements _____

How is spare time spent? _____

What extra reading? _____

Ever do any public speaking? _____

Church affiliations _____

Preparing for what: As definitely as you know now _____

DO NOT WRITE BELOW THIS LINE

CONFERENCE IMPRESSIONS

Mobility of expression _____ Voice _____

Dress _____ Articulation _____

Figure—slim, medium, thick-set, fat, straight, crooked, bent _____

Manner and pose—graceful refined, vigorous, courteous, enthusiastic, winning, slow, quick, assertive, conceited, vivacious, taciturn, sleepy _____

Conversational ability _____

Interest in people _____

Outlook on life _____

In what respects inferior to fellows _____

In what respects superior to fellows _____

THE UNIVERSITY OF CHICAGO

The College of Commerce and Administration

C O N F I D E N T I A L

_____has applied for admission to the College of Commerce and Administration. Inasmuch as this college aims to prepare students for actual business and professional service, it is essential for the Dean of the College to have a complete record of each student's previous business or profes - sional experience. We should accordingly appreciate your estimate of the quali- ties of the person mentioned above. It will be quite satisfactory to have this estimate stated as answers to some of the following questions or in any other form which you may find better suited to the needs of the case.

1. In what qualities do you consider him superior to his fellows?_____

2. In what qualities do you consider him inferior to his fellows?_____

3. Can one depend upon him? _____

4. Is he industrious? _____

5. Is he able to take correction properly? _____

6. Is his personality pleasing? _____

7. Do you know of any bad habits he possesses?_____

8. Have you any other information or suggestions growing out of your experience with this student which will be helpful in shaping his curriculum? _____

Name of person who fills out the blank _____

Official Position _____

The back of the sheet may be used for additional information.

The University of Chicago

The College of Commerce and Administration

TRAINING FOR
PUBLIC SERVICE
BUSINESS SERVICE
SECRETARIAL WORK
COMMERCIAL TEACHING
PHILANTHROPIC SERVICE

_____ has applied for admission to the College of Commerce and Administration. In this college, an individualized curriculum is assigned each student, the courses varying according to the past training, present capacities and contemplated occupation of the student. Obviously, accurate knowledge concerning the student is essential to the success of such a plan. We should accordingly appreciate your estimate of the qualities of the person mentioned above. It will be quite satisfactory to have this estimate stated as answers to some of the following questions or in any other form which you may find better suited to the needs of the case.

1. In what particulars is this student strong scholastically?_____

2. In what particulars is this student weak scholastically?_____

3. In what qualities do you consider him superior to his fellows?_____

4. In what qualities do you consider him inferior to his fellows?_____

5. Have you any other information or suggestions growing out of your experience with this student which will be helpful in shaping his curriculum?_____

Name of person who fills out the blank_____

Official position _____

The back of the sheet may be used for additional information.

The University of Chicago

The College of Commerce and Administration

TRAINING FOR
PUBLIC SERVICE
BUSINESS SERVICE
SECRETARIAL WORK
COMMERCIAL TEACHING
PHILANTHROPIC SERVICE

In the space below please submit in typewritten form a 200- to 250-word "life history." Make it clear-cut, concise, and business-like. Make it of such a character that the person who reads it will have a fairly clear idea of your life background. This will cause you to include statements of date and place of birth, home influences, education, travels, ambitions for the future, and any other items which have been significant in your case.

CHAPTER II

Psychological Tests for College Students

The use of psychological tests with college students is not new as the abundant literature upon Freshman tests bears witness.[2] The feature distinguishing the present application, however, is that while previous investigations have been primarily devoted to the study of tests, and rightly too, the present investigation had for its object primarily the student and his immediate relation to the university. In this case the tests were only the instrument—the student, the goal. The objection is sometimes raised that the status of mental tests is so undecided that one is not warranted in subjecting them to the arduous strain of practical application until further development is reached. To await perfection, however, is obviously impossible; furthermore, one dare not say that the patient work of past investigators has been for naught. Surely something has been gained; some difficulties have been overcome; some refinements of technique have been brought about; some pitfalls have been exposed. True, many theoretical problems remain unsolved, and in an application of this kind one encounters them at every turn. Still it seems wise to slur some of them for the sake of the goal, and while frankly admitting the tentative and incomplete nature of the results one may still ascribe some reliability to them. One may also point to the fact, now almost truistic, that theoretical psychology gains much from these early applications of psychological method to practical situations, and there is reason to hope that serious efforts to approach the actual problems of university administration by such means will serve to focus more attention upon mental tests and thereby further their development. In spite of imperfections, then, the research was undertaken with the conviction that

[2] For history of Freshman tests see Mary T. Whitely. An Empirical Study of Certain Tests for Individual Differences. Archives of Psychology. No. 19, New York. August, 1911. pp. 1-13.

psychological methods offer a mode of approach to some of the problems of university administration and a two-year trial has shown the hope to be justified. It is easily understood that in such work as this, the complete demonstration of results demands long and thorough trials by many workers, under various conditions. Therefore the claims of the present investigation must rest largely upon questions of methodology. It is in this direction that progress must first be made. The undertaking here reported was the trial of a method, and any claims for the psychological data presented are secondary to the claims adduced in favor of the method. The hypothesis adopted was that psychological measurements are helpful in making a scientific study of the student, but that when they are to be used for purposes of interpreting or controlling everyday activities, they must be accompanied by other facts of interpretative value. So in the present work, the usefulness of the tests is to be regarded as conditioned upon the other means provided for studying the student.

The general plan of the psychological examinations was to devise a system for measuring the mental capacity of college students in order to guide their college work. Secondary aims included that of measuring mental ability from time to time throughout the student's progress in order to determine the effect of college training. The way also seemed opened for comparing various groups of students in order to observe the differences among groups. The clinical aspect of the work also presented opportunity for giving individual aid to students in forming habits of study. Each of these phases will be discussed in later chapters.

Briefly stated, the plan was to choose from the large array of tests available, those that seemed most likely to be of service for diagnostic purposes. Stern[3] states the requisites of such tests as follows: "three things are evident: first,

series of tests must be arranged that will set in play the various constituent functions of intelligence; secondly, for this purpose

[3] W. Stern, Psychological Methods of Testing Intelligence, tr. Whipple, Warwick and York, Baltimore, 1914. p. 22.

there must be a wise *selection* of tests; out of the immense number of possible tests only those should be chosen that afford a decided and a reliable symptomatic value, general applicability, and possibility of objective evaluation; thirdly, there must be created a system by means of which the several particular results of the testing can be united into one *resultant value,* i.e., a value that shows the grade of intelligence of the subject objectively in an inclusive formula in which performances of different degrees of value shall in some way be compensated."

In attempting to arrange a workable series of tests it is found that there is a deplorable diversity of opinion and practice regarding particular tests, and a wide variation in manner of administering them. A further obstacle is the paucity of correlations that have been shown between specific tests and everyday activities. The ideal method of selecting tests to be used for diagnosing mental ability is to try out a large number of tests and to correlate results with a great variety of activities. The tests having the highest degree of correlation with such everyday activities would then be most reliable for diagnostic purposes. Such a method of selection is obviously beyond the reach of one investigator. Lacking the power to show such rigid correlations, however, there are other criteria that may be employed, First, it is possible to make an *a priori* selection on the basis of methodological fitness. The form in which a test shall be given may be determined to some extent by the experience of other investigators. In memory tests, in tests involving perceptual activities, in association tests, considerable work has been done, and the technique has been partially standardized. Care was taken in the present selection, to follow these standardized modes of procedure so far as possible. It was not possible to do this completely inasmuch as several complex situations were desired that required specially devised tests. Still the standardized tests were mostly used as will be observed by one familiar with the literature.

Another consideration that modifies the selection of tests for such a series is economy of time and effort. If psychological tests are to become generally useful in college and university administration they must be handled economically. This makes

group work desirable, so far as possible, and tests must be chosen that can be so adapted. In the series about to be described about half of the tests were given by group. Some of the other tests could easily be arranged for group administration. In the opinion of the writer, however, some tests should be given individually. Satisfactory diagnosis demands some personal contact with the student, and a period of time spent in the laboratory is of considerable value in enabling the psychologist to study the characteristics of the student at close range. The necessity for economy of time and effort resulted in the omission from the series of any extended learning tests. This is perhaps, unfortunate, but experience has shown that it is impracticable to commandeer the time of a large number of university students for more than three periods throughout the year.

It is also desirable, in choosing tests, to avoid those that may be seriously affected by practice. Furthermore, if the tests are to be given to the same students year after year, they should be of such a nature that memories held over from year to year will not be of assistance.

On the symptomatic side, much room for choice also exists on *a priori* grounds. It is certainly possible to select tests that call for a variety of mental activities. There exist a number of good tests for memory ability; others furnish means for measuring associative activities; almost all tests that *are* tests of intelligence demand a high degree of attention. A complete inventory of the mind is out of the question, nevertheless it is possible to select good tests for measuring fundamental psychical activities, and the net result will be an insight into the general capacity. Every test employs the whole mind, and the reaction to each one will measure the activity of the mind in one of its modes. Of course the modes are not all equal in development, but the qualitative disparities can be disregarded by the use of a kind of compensation mechanism. In the light of some of the recent investigations in the field of mental tests, there is experimental evidence for the selection of certain tests over others. Simpson,[4] after an intensive study of a variety of tests recommends the testing

[4] B. R. Simpson, Correlations of Mental Abilities, New York, 1912. p. 110.

especially of the following abilities in the relative order stated, "(a) selective thinking, (b) memory and association, (c) quickness and accuracy of perception, (d) motor control, (e) sensory discrimination." In the present collection of tests, though no attempt was made to classify rigidly, still the functions employed most actively are probably selective thinking, memory, speed of association and quickness of perception.

Chronology of Tests and Description of Subjects

After a comprehensive survey of mental tests with the above considerations in mind, twelve were chosen for the first year's work. Manipulation of the data from these served to augment the number of measures to sixteen. Only the names of the tests will be given here; full description will follow in Chapter III.

1. Number-checking.
2. Memory for Numbers Heard.
3. Memory for Objects Seen.
4. Memory for Logical Material, Heard.
5. Secondary Memory for same.
6. Immediate Memory for Logical Material, Seen.
7. Secondary Memory for same.
8. Loss in Logical Material Heard.
9. Loss in Logical Material Seen.
10. Opposites Test.
11. Constant Increment Test.
12. Hard Directions Test, Printed.
13. Directions Test, Oral.
14. Word-building Test.
15. Sentence-building Test.
16. Business Ingenuity Test.

On February 20, 1914, the first group of students was examined with tests numbered 1, 2, 4, 6, 14 and 15, given in the above order. Two weeks later the group was called together again and tests numbered 5, 7 and 16 were given. Both group examinations took place in the morning and required one and one-half hours and one-half hour respectively. The rest of the tests were given individually at the psychological laboratory. They extended over a period of time from February 23 to March 17, 1914. They were given in the order 3, 10, 11, 12 and 13, and required about twenty minutes.

This first group of students numbered seventy-seven. It consisted of all Freshmen in the college and some others whom the dean wished examined. The figures here presented, however, are not compiled from the work of this entire group. In establishing norms for the series, it was desired to use only those records which were complete—that is, which contained a score for every test. This eliminated some records, since unavoidable absences and laboratory accidents occurred. Other records were eliminated because of language difficulty resulting from foreign birth or speech defect. As is often the case, there were also a few who misunderstood directions. Such circumstances reduced the number of usable records to forty. These forty students were classified academically as follows:

Freshmen	32	or	80%
Sophomores	6	or	19%
Juniors	2	or	1%

Thirty-one were men and nine, women. The average age October, 1913, was 19.9. The norms which are to be presented, are thus seen to be not entirely Freshmen. This will not hinder the computation of Freshman norms, however, as in all cases where comparisons are shown, the subjects are grouped academically. The results secured with this mixed group are employed only in determining relationships among the tests. This procedure seemed justified inasmuch as it was necessary to establish norms as soon as possible in order to obtain a working basis for diagnosis, and it seemed wise to retain as large a number of records as possible in order to give greater reliability to the averages. Moreover for purposes of gauging the value of the tests as a series the class of subjects used is of little account.

It should be pointed out that the confinement of this study to the College of Commerce and Administration resulted in the use of a selected group of students. In the first place these students entered the university with a high-school average grade better than 80% (according to the ruling of the university). They are further selected in that they have similar vocational aims. The college offers preparation for "careers in the practical pro-

fessions or the various branches of business, charitable and philanthropic service." These considerations undoubtedly affect the norms slightly and they were certainly influential in determining the nature of some of the tests.

The 1914 Freshmen were first examined on November 9 of that year. Forty complete records were secured from this group. Exactly the same tests were employed as were used with the previous group. The group was called together again on November 24, 1914, and tested for secondary memory as described above. Individual tests were given during the interim.

The statistical side of this investigation resolves itself into several problems. Therefore the figures will be presented from several points of view. The first task is to make an evaluation of this particular series of tests as a series. This will be assayed in Chapter IV. Chapter III will be devoted to a description of the tests.

CHAPTER III

Description and Discussion of Tests

Inasmuch as this investigation aimed primarily to make a study of the student, not of the tests, no attempt will be made to give an exhaustive critique of each test. This has already been done for some of the tests by previous investigators and standardization has already been partially accomplished. As arranged in this series, however, the tests have not been previously used, therefore they require some examination in order to ascertain their practical diagnostic value as a whole. The tests will be described in detail and the discussion will be made as full as circumstances permit.

All tests were given in the morning. All were given by the writer. When tests were given individually an assistant was present to record results and the same assistant served during both years. Before the tests were cast in final form they were used with an experimental group consisting of twelve students in psychology. This gave opportunity for the elimination of undesirable features and also served to give the experimenter facility in handling the tests.

The total series required about two and one-half hours' work from each student, the time being divided into three periods; the first group test required one and one-half hours, the second group test, one-half hour and the individual test, twenty or thirty minutes. Tests designated *g* were given by group; those marked *i* were given individually. The latter were given in the psychological laboratory, the former, in a large, well-lighted recitation room. The students were seated in alternate seats and were provided with pencils. The following remarks were made by way of introduction to the tests:

"We shall devote the next hour and a half to a series of psychological tests. You will be excused from your next class if you have one.

"I wish to quiet any fears you may entertain about these tests, by assuring you that there is nothing mysterious or occult about them. They are simply tasks such as you perform every day, involving ordinary feats of memory, reasoning and attention. The distinguishing feature is that exactly the same task is set for each person and the objective conditions are the same for

every one. I wish to obtain as true a measure as possible of your mental ability, so ask that you put forth your maximum effort.

"The results will not give a 'map' of your mind, neither will they tell your fortune as a slip from a nickel-in-the-slot machine. But we hope to obtain some facts which will assist in planning your course through the university.

"Remember, these are simply common, everyday tasks, to be performed under experimental conditions, and your only concern is to give them your entire attention and most conscientious effort."

Care was taken to avoid interruption during the tests.

Test No. 1. Number-checking[5] *g*

Materials: Forms like sample laid face downward upon the desks.[6]

Directions: "On the reverse side of the paper before you are printed the ten Arabic numerals arranged in rows like this (showing sample). When I give the signal you are to begin at the first line and go across the paper, crossing out all the sixes. Work as fast as possible for I wish to see how rapidly your mind can act; only do not miss any. The number six appears five times in each row, so you can easily tell when you have checked all in one row. Make any kind of a mark you wish. If you happen to make a mistake and cross out the wrong number, do not stop to erase—simply draw a ring around that number and I will understand. Two minutes will be given. When I call time, stop instantly and turn over the paper face-downward. I will give the signals, Turn, Go, and at the expiration of the time, Stop. Any questions?"

5 1 6 8 4 9 2 3 7 0 1 2 7 5 0 4 8 6 9 3 4 1 8 9 0 2 5 6 3 7 1 7 5 6 0 8 9 2 4 3 7 8 6 9 0 4 3 1 2 5
7 8 0 5 1 3 4 2 6 9 2 4 0 9 7 6 1 5 3 8 3 2 0 4 1 5 7 9 6 8 4 8 1 2 6 7 3 9 0 5 3 7 9 0 8 6 5 2 1 4
3 5 9 7 8 4 6 1 0 2 5 1 8 2 3 7 4 9 6 0 8 5 9 3 2 4 1 0 7 6 9 3 4 5 2 0 8 6 1 7 9 3 1 6 7 5 8 4 0 2
2 7 3 9 6 5 0 8 1 4 9 7 3 6 1 5 0 2 8 4 0 4 7 8 5 9 6 2 1 3 0 9 3 1 5 6 4 8 7 2 4 2 3 5 6 7 9 0 8 1
4 2 5 3 0 1 7 9 8 6 3 8 6 0 9 1 5 4 7 2 9 3 6 7 4 8 0 1 2 5 6 4 9 3 1 2 0 7 5 8 6 1 2 7 4 9 0 5 3 8
9 4 7 0 3 8 5 6 2 1 6 0 9 3 8 2 7 1 4 5 7 8 1 0 9 6 4 3 5 2 5 2 7 9 4 1 6 3 8 0 1 0 4 8 2 3 7 9 5 6
0 9 8 2 5 6 1 7 4 3 8 3 5 4 6 9 2 0 1 7 6 0 2 1 3 7 9 5 8 4 2 1 8 4 9 5 7 0 3 6 0 9 5 2 1 8 6 7 4 3
1 0 4 6 2 7 9 5 3 8 0 6 2 8 4 3 9 7 5 1 2 7 4 5 6 0 3 8 9 1 3 5 0 7 8 4 2 1 6 9 5 6 8 1 9 2 4 3 7 0
8 6 1 4 9 2 3 0 5 7 4 5 1 7 2 8 6 3 0 9 1 9 5 6 8 3 2 7 4 0 8 6 2 0 7 3 5 4 9 1 2 4 7 3 5 0 1 8 6 9
6 3 2 1 7 0 8 4 9 5 7 9 4 1 5 0 3 8 2 6 5 6 3 2 7 1 8 4 0 9 7 0 6 8 3 9 1 5 2 4 8 5 0 4 3 1 2 6 9 7
7 9 6 2 1 3 4 0 5 8 4 2 5 1 9 3 8 6 0 7 9 0 4 8 1 7 2 3 6 5 6 2 8 3 0 5 1 4 9 7 5 9 4 8 0 7 1 2 3 6
9 6 8 1 0 5 3 7 4 2 1 9 4 5 3 7 0 2 6 8 0 4 7 2 3 8 6 5 9 1 9 0 3 6 8 2 7 1 5 4 7 5 0 3 2 9 4 1 6 8
0 7 3 4 2 9 1 8 6 5 9 6 1 2 4 8 7 0 5 3 1 9 8 3 0 6 5 4 7 2 1 5 7 9 3 4 8 2 6 0 8 3 5 9 7 2 6 4 0 1
3 4 7 6 8 1 2 5 9 0 6 3 0 7 5 9 4 8 1 2 4 8 5 9 7 3 1 2 0 6 7 1 0 2 9 6 4 5 3 8 3 4 7 1 6 5 2 8 9 0
6 5 9 7 3 2 8 4 0 1 0 8 3 6 1 4 9 7 2 5 2 5 3 4 6 9 0 1 8 7 5 4 1 7 2 8 3 9 0 6 1 2 6 5 8 3 0 7 4 9
8 3 5 0 9 4 7 2 1 6 8 5 7 0 2 1 3 9 4 6 5 2 1 0 8 4 7 6 3 9 2 7 4 5 1 9 0 6 8 3 6 8 9 7 1 0 3 5 2 4
1 8 0 9 7 6 5 3 2 4 2 7 8 4 6 5 1 3 9 0 3 1 2 6 9 5 8 7 4 0 4 8 2 0 5 1 6 3 7 9 4 1 8 0 5 6 9 3 7 2
2 0 4 8 5 7 6 1 3 9 7 1 6 8 0 2 5 4 3 9 6 7 0 1 4 2 3 9 5 8 0 6 9 4 7 3 2 8 1 5 2 0 1 6 4 8 7 9 5 3
4 1 2 5 6 8 0 9 7 3 5 0 9 3 7 6 2 1 8 4 8 6 9 7 5 1 4 0 2 3 8 3 5 1 6 7 9 0 4 2 9 6 2 4 3 1 5 0 8 7
5 2 1 3 4 0 9 6 8 7 3 4 2 9 8 0 6 5 7 1 7 3 6 5 2 0 9 8 1 4 3 9 6 8 4 0 5 7 2 1 0 7 3 2 9 4 8 6 1 5

[5] R. S. Woodworth and F. L. Wells, Association Tests. Psychol. Rev. Mon. Sup. 1911. 13, p. 26.

[6] Blanks for Tests No. 1, 10, 11, 12, 14 and 15 were secured from C. H. Stoelting and Co. In this test and all others where time was kept, an ordinary stop-watch was used.

Method of Scoring: Each digit checked correctly counted one unit. No deductions were made for omissions or wrong figures checked.

This test, recommended by the Committee on Standardization from the American Psychological Association, involves a number of factors. Some of these are: (1) a high degree of concentration, (2) quickness of perception for visually apprehended forms, (3) speed in motor response, (4) susceptibility to eye-strain, (5) ability to persist beyond the point of fatigue. The two-minute period devoted to this work was undoubtedly one of extremely close application.

Though no errors were counted in scoring, still observation of the errors made by an individual in this test throws some light upon the care with which one does work of this nature. Of the forty individuals whose records were used, more than fifty percent (twenty-two) made no errors,

5	made	1	error,
6	"	2	errors,
3	"	3	"
2	"	5	"
1	"	8	"
1	"	11	"

As will be seen in Table IV, this test ranks lowest in degree of correlation with the results of the whole series. This would be expected in view of the fact that it places more emphasis upon motor factors than most of the other tests.

This test seems on the whole, to be a useful type of test, for the purposes for which it was used, not from the standpoint of its high correlation with "general intelligence" but for its corroborative value. It calls for the exercise of considerable speed, and in conjunction with other tests of mental quickness, probably offers some corroborative evidence in accentuating a tendency toward one extreme or the other.

The tests that are generally recognized as of a quite purely memory type will next be described. It will be noted that the

assortment used was quite varied, the attempt being made to secure rote material, material logically connected, to test memory for impressions made through two different sense avenues, and to test immediate and deferred reproduction.

Test No. 2 Numbers Heard[7] *g*

Materials: Blank sheet of paper and pencil.

Directions: "I am going to read some numbers aloud, and shall ask you to listen very carefully. When I have finished each group, and not until then, I wish you to write the numbers down just as I give them—the same numbers, in the same order. If you leave out any one, indicate its position in the group by a dash. Before giving each group I will tell you how many digits it contains. Questions?"

6135
2947

36814
57296

241637
935816

8537142
9412837

47293815
71836245

924738615
475296318

8697132504
2146073859

Practice was given with two groups of three digits each, using the numbers 816,435. Of course, the groups of four digits each also served as practice groups, inasmuch as they are too short

[7] G. M. Whipple, Manual of Mental and Physical Tests, Warwick and York, Baltimore, 1910. p. 362.

to be real tests of memory for college students. The numbers were given at the rate of two per second.

Method of Scoring:[8] The score represents the number of digits reproduced in correct order.

Test No. 3. Objects Seen. *i*

Materials: Covered box twelve by twenty by three inches, containing the following objects fastened to the bottom: fountain-pen, pencil twenty-five cent piece, envelope, ink-well, maroon ribbon, ruler, pen-filler, two-cent stamp and key.

Directions: "I am going to show you a group of objects for six seconds, then will ask you to name them aloud from memory."

Method of Scoring: The score represents the number of objects correctly reproduced.

Test No. 4. Logically Related Material, Heard *g*

Materials: Blank sheet of paper and pencil.

Directions: "I am going to read you a rather long passage and shall ask you to listen very carefully, for when I have finished, I wish you to reproduce the meaning of the passage. The passage is too long for you to remember word for word, but try to get the entire meaning, then in reproducing, use the same words as appear in the text whenever you can."

More than once, | it has happened | in the history | of science, | that a phenomenon | predicted | by theory, | has not been brought within the range of actual observation | until long afterwards.| An astronomer | predicted | the existence | and location | of the planet | Neptune, | but it was not until some time later | that the planet | was found | at the predicted spot. | Similarly, | a physicist | unfolded | theoretically | the phenomenon | of the so-called refraction of light, | but it was reserved | for a successor | to observe | the fact.| A third | instance | is found | in the fortunes | of the theory of audition.| An eminent | physiologist | of the nineteenth century | suggested | that the little | hair-cells | in

[8] For discussion of methods of scoring this test, see H. T. Woolley and C. R. Fischer, Mental and Physical Measurements of Working Children, Psychological Review Monograph Supplement, No. 77, December, 1914. p. 124 ff.

the inner | ear | vibrate | sympathetically | when appropriate | wave-lengths | reach | the ear. | Some time subsequent | to the proposal | of this explanation, | minute, | hairy | filaments | on the bodies | of Crustacea | were seen to vibrate | sympathetically | when sounds | were made | in the vicinity | of the animals.| On investigation | these hairs | were found to be connected | with the auditory nerve, | and to constitute | the mechanism of hearing | for the animal.| The analogy | of this arrangement | to the structure | of the human | inner | ear | was instantly seen, | and thus that which had previously | been propounded | as a theory | was established | as a fact.|[9]

Method of scoring: It will be noted that this passage, as does the following one, contains a main proposition and three illustrations, the last one of which is amplified. For reproduction of the main proposition two units were given; for mention of the first, second and third illustrations there were given 14, 13 and 14 units respectively. Thus by merely stating the main proposition and the illustrations, the individual could score 43. In addition to these gross divisions, the passage was further divided into 81 "ideas." Counting each of these as two-thirds of a unit, their united value is 54, which added to the 43 units mentioned, permits scoring on a basis of 97 points for correct reproduction of the passage.

Test No. 6. Logically Related Material, Seen. *g*

Materials: Papers containing the passage beginning "When a man confines—" in mimeographed form laid face-downward on the desks.

Directions: "On the reverse side of the paper before you will be found a long passage which I wish you to read carefully when I give the signal. Read it but once, then turn it over, and on the back of it write all you can recall of the passage. Be careful to read each sentence but once, then turn over the paper and reproduce the meaning as accurately as possible."

[9] Adapted from Popular Science Lectures, E. Mach. Open Court Publishing Co. Chicago, 1895. p. 29.

When a man | confines his activities | to one particular field, | attempting | to specialize therein, | there is great probability | that his capacity for enjoyments | of an aesthetic | or spiritual character | will be lost.| Let a man who loves poetry | drop all interest in literature | for a long time, | and give himself up | to the ardors | of scientific research, | and he will find | that the beauties | of poetry | in time | cease to have any charm for him.| Similarly, | let one who was deeply religious | in early life, | leave off religious activity | and turn his attention | to the pursuit of wealth, | and he will find | that the fires of religious zeal and enthusiasm | grow cold, | leaving him unresponsive | to religious appeal.| A pitiful | example | of this tendency | toward atrophy | on the part of the emotions, | is found | in the case of Darwin.| In his youth, | he was a passionate | lover of music, | but was unable to maintain his interest in it, | owing to his absorption |in scientific pursuits.| In later life,| he sought | to revive his interest | in music,| but discovered | to his intense sorrow | that he was no longer able to find enjoyment therein.| He had so long | neglected | the faculty | of musical enjoyment | that it had become completely atrophied.|

Method of Scoring: For reproduction of the main proposition, two units were given; for statement of first, second and third illustrations, 14, 13 and 14 units respectively were given. In addition to the 43 units thus credited, the passage contained 57 "ideas" which counted as one unit each, thus permitting scoring on the basis of 100.

Tests No. 5, 7, 8, 9,—Deferred Reproduction of Logically Related Material Heard and Seen.

Materials: Blank sheets of paper.

Directions: **"Write all you can recall of the passage I read to you at the last psychological examination beginning. "More than once it has happened in the history of science."**

"Write all you can recall of the passage you read at the last psychological examination, beginning, "When a man confines his activities to one particular field."

Method of Scoring: Same as above. It happened that in the second reproductions some subjects reproduced more "ideas"

than they did the first time. Such gains were not counted in comparing the amounts lost; the individual simply being credited with having lost nothing. To one who has scored memory tests, the difficulties of the present task are manifest. It is necessary to lay down arbitrary rules and to adhere to them closely. Some of those most constantly used in the scoring of these passages are as follows:

1. When an "idea" was repeated no credit was given for the repetition.

2. When "ideas" were interpolated which were clearly not found in the original passage, but were mere wild guesses, no credit was given.

3. In mentioning the illustrations, if an individual gave half of an illustration, half credit was given. For example, some remembered that the second illustration in the passage heard contained something about a physicist but could not recall the idea "refraction of light." Such an incomplete statement was given a credit of 7 instead of 13.

The difficulties of scoring memory passages need not be unduly magnified. It is true that the order in which the "ideas" are reproduced does not follow the original with strict fidelity, still, owing to the faithfulness of the retentive powers of the mind, it is possible, after some experience in scoring, to match up the various meanings and to identify them with the original sources with a tolerable degree of accuracy.

As already said these memory tests were planned with view to securing a variety of measures. On the basis of material they may be classed as Rote and Logical. On the basis of sense organ impressed, the material was either heard or seen. Lastly the effort was made to measure both primary and secondary memory, the latter reproduction occurrring two weeks after the first.

In manipulating the measures secured by the use of Tests 2 and 3 one is handicapped by small range of measures. This tends to obscure the meaning of the measures. In Test 2 a wider range of measures might be secured by adopting a different method of scoring. Credit might be given for position of the digits as well as for correct reproduction. This method has disadvantages,

however, some of which are discussed by Whipple[10] and Woolley and Fischer.[11]

In Test 3 the difficulty due to small range of measures might be reduced somewhat by the use of more objects exposed for a longer time. Whipple[12] suggests, however, that likelihood of such improvement is slight. This test might be arranged for administration to a group by the use of a stereopticon slide showing a number of objects. These might be exposed on a screen for a given length of time, then the subjects might write down the names of the objects. This arrangement would permit of testing for deferred memory, a difficult accomplishment when the test is given as an individual test.

In all objects tests care should be taken to use objects with simple names, and objects whose names come readily into consciousness. Otherwise the results might be misleading because it might happen that an image of the object would be before the subject, still he might fail to name it because the name would refuse to come. For this reason care was taken to select objects common to the everyday experience of university students.

The degree of logical relationship (in terms of use) between objects also affects this test. It will be noted that the objects here used are frequently associated in use, e.g., envelope, stamp, pen, etc. It is possible that with objects not so frequently associated, the results would have been different.

Reference to Table III (p. 50) shows only a slight degree of correlation between the results of these two so-called "memory tests." Their correlation with the results of the other "memory tests" is equally slight. This may be due to the small range of measures already referred to. Another reason, however, may be that these two tests involve immediate recall, which is to some extent a "restoration of the original impression which is slowly fading." The impression is still in the foreground of consciousness and partakes of much of the freshness of the original impression before it has been vitiated

[10] *Op. cit.*
[11] *Op. cit.*
[12] *Op cit.*, p. 250.

by the disturbances of time and conflicting impressions. For this reason the reproductions were probably favored by the sense avenue used in impression. In the reproduction made by persons in whom visual impressions tend to persist, the perseverance of the impression might be a factor, while in the case of persons whose visual impressions do not persist so easily, reproduction would be scanty. The same tendency applied in the auditory field might affect Test 2. Hence the memory factor, which judging by the low correlation seems to operate with unequal force if at all, may be obscured by this factor of the rapidity with which the impression fades. Most of the evidence seems to favor tests for secondary memory over those that call for immediate reproduction only.

The tests for "logical" memory were planned to show differences between immediate and deferred reproductions. Here retentive capacity is unquestionably demanded. The impressions must be retained over a considerable period of time. This results usually in some losses. The change is not only of a quantitative nature, affecting the number of "ideas" retained. It is also qualitative. The material becomes in the interim, distorted in all sorts of ways because of the entrance into the mind of conflicting impressions. Some of these become associated with those retained and become part of the fabric of the first impression. Even when new material is not introduced, the original material may lose its shape and some parts may assume prominence over others.

It should be kept in mind that the numerical results do not tell the whole story in any person's reproduction. There exist qualitative differences among the reproductions which can not be expressed numerically. Particularly is this true in deferrred reproductions. Here two persons may give the same number of "ideas," but the faithfulness with which they adhere to the original both in order and in content, may be quite different. Furthermore the same number of ideas may appear in two reproductions, but they may differ greatly in importance. This important qualitative distinction was partially provided for by the method of scoring which gave much weight to the main points of the passages. Any qualitative differences, then, con-

cerned only the minor points, and in the arrangement of the passages, it was aimed to have these minor points of approximately equal importance. In general it might be added, that subjects who have most profuse "ideas" generally give the best presentation from a qualitative standpoint, while those whose "ideas" are scanty generally give the poorest reproductions from a qualitative standpoint. On the whole, then, the above method of scoring represents the facts fairly satisfactorily.

An important factor in measuring secondary memory is the mental attitude assumed toward the time of reproduction. If a subject memorizes for the purpose of retaining only a short time, there is likelihood that he will forget when the period for which he consciously memorized has passed. On the other hand if he intends to retain for a long time, he will likely retain better than if he formed no conscious intention. Allowance for this contingency could not be made in these tests, since it was feared that if announcement were made that deferred reproduction would be required, there would be reviewing on the part of some persons. The amount of review could not be controlled, therefore it was regarded as more practicable to say nothing about future reproduction.

The attempt was made to have the two logical passages as near alike as possible. Each was constructed in the same manner, having a main proposition with three illustrations, of which the third was amplified. Each had about the same number of words. In subject-matter there is not the same equality, the material in Test No. 6 probably being easier to grasp and to retain than that in Test No. 4.

This type of test calls for attention to logical connection and so has some reasoning involved. The activity is not a mere copying of facts; the mind looks for relations and retains the facts by means of the relations apprehended. During presentation the mind is active and anticipates the next step, then reproduction is a process of reinstatement. Those persons who characteristically look for logical connection between experiences, saw at once the relation between the parts of the passages and reproduction of the main topics was an easy matter. Some of the

subjects reported that they kept track of the sub-topics on their fingers, relating each one to the main proposition. They habitually schematize experiences and place them in headings and sub-headings in their minds. Persons who do not follow connected trains of thought easily would not see the relation between the parts so clearly, therefore they would miss some sub-topics. Details, however, might be recalled in profusion regardless of propensity for straight thinking.

Judging from the degree of correlation found between the results of the memory tests it appears that the most reliable test for memory is that for deferred rather than immediate reproduction. The scores in immediate reproduction of logical material heard and seen correlate with an index of .26, but after an interval of two weeks the residuum is constant enough to produce a correlation coefficient of .54, showing that the subjects tend to assume the same positions in the group as time goes on. As might be expected, the losses correlate with a similar degree of correspondence, .54.

The retention factor in the process is probably more influential than the sense avenue utilized in making the impression. This is suggested by the low index of correlation between scores in Tests 5 and 7 and by the fact that the correlation between scores in immediate and deferred reproductions is higher, .49. Similarly that between scores in material seen and reproduced immediately and the same thing reproduced two weeks later is also higher, being .45. This conclusion is further strengthened by reference to the correlation between results of Numbers heard and Objects seen which is but .09. The results indicate that the more reliable measures of memory are obtained by the method of deferred reproduction. Of course the second reproduction was doubtless influenced somewhat by the "immediate" reproduction. This fixed the matter somewhat more firmly in mind than if immediate reproduction had not been required. It is easily seen, however, that in this preliminary investigation it was necessary to have both records for purposes of comparison.

The memory tests on the whole seem good tools with which to study the mental ability of students. Marked differences

were discovered between the two sense avenues as media of presentation for certain students, and on questioning, they reported that their experience had borne out the findings of the tests. The tests also proved to be fairly consistent measures of the efficiency of immediate versus secondary memory. These findings, also, corresponded closely with the introspections of the students. Altogether, these memory tests furnished data of value quantitatively and qualitatively, and furnish a group of measures that balance or "compensate" for those tests which emphasize particularly rapidity of the mental processes. The form in which these tests were administered makes them easy to give, but there is great need for standardization of passages suitable to college students. Many kinds of material should be studied from the standpoint of equality in difficulty, interest-value and familiarity.

Test No. 10. Opposites.[13] *i*

Materials: List of Easy and Hard Opposites.

Easy Opposites List	Hard Opposites List
long	north
soft	sour
white	out
far	weak
up	good
smooth	after
early	above
dead	sick
hot	slow
asleep	large
lost	rich
wet	dark
high	front
dirty	love
east	tall
day	open
yes	summer
wrong	new
empty	come
top	male

[13] Woodworth and Wells, *op. cit.*, p. 60.

Directions: "I am going to give you two lists of words and ask you to say the opposite to each word as quickly as possible. Do not say the word you see on the card. Give the opposite. Examples: Give opposite of *better*, of *glad*." The subject was handed each of these lists and was directed to say the opposites aloud.

Method of Scoring: The work was scored both for speed and accuracy, the former being represented by the number of seconds from the beginning of the first response to the end of the last one. In scoring accuracy, each list was graded on the basis of 100 with 5 deducted for every wrong response or failure to respond within 15 seconds. These scores were combined into a net index by dividing the time by the accuracy. The score thus represents the time required for forty reactions divided by the accuracy score. In cases where no errors were made, the score represents time alone. In such a comparatively simple test as this, it is readily apparent that accuracy is obtained with comparatively little difficulty on the part of college students. Almost half of this group of subjects obtained a score of 100 in each list. Of the forty students, 31 scored 100 in accuracy for the Easy test and 21, for the Hard test, indicating that they are rightly designated, Easy and Hard.

The scoring of Opposites tests is always made difficult by the fact that some words have more than one opposite. An arbitrary system must be adhered to in evaluating responses. The two lists here used are free from these difficulties to some extent, thanks to the work of the Committee on Standardization. Accordingly it was decided to score words only right and wrong, and not to give half-credits. In the case of a few words. however, there still remains some ambiguity. To each of the following words more than one opposite is possible, and either one was counted correct.

above	below,	under
slow	quick,	fast
front	back,	rear, behind
dead	alive,	living
open	shut,	closed
come	go,	gone, went
empty	full,	filled
far	near,	close

There are a few more words in the lists that present ambiguities, but any responses to them other than the generally accepted opposites were not counted as correct so they are not included in the above list. They offer a serious obstacle to the success of the test, however, and should be eliminated. The disadvantage of ambiguous words connects itself not only with the production of two or more words from which scoring must be made; it also concerns the mental attitude of the subject. In the opinion of the writer, these ambiguous words are productive of long pauses and incorrrect responses because of conflict of impulses. The conflict may be of a logical nature, or as Jung[14] opines, of an essentially emotional character. The process probably consists of an impulse to say one word, then before the response can be made, an impulse arises to say another word. The result is a long pause, or a complete inhibition of response, or an incorrect response. Two examples will illustrate the point. The word "come" was a stumbling-block to many of the subjects. On the theory just presented, the long pauses or failures may be due to the fact that the word has two opposites depending on the tense in which it is interpreted. In the present tense, the proper response is "go," but in the perfect tense, the opposite is "gone." "Went" was given most frequently next to the correct opposite. The word "love" was another stumbling-block. The difficulty here may be two-fold. In the first place it may consist in the fact that the word can be regared either as verb or noun. The words commonly associated with it are, "hate" and "hatred" and the conflict might produce a long pause or a complete deadlock. There is another type of explanation, however, which instantly occurrs to one in the light of recent pronouncements from Freudian sources. It may be that the word "love" is provocative of such strong emotional reaction in these adolescents that its usually associated opposite can come into consciousness only with great difficulty. Again, there may be only an aversion to saying "hate," the pause representing a search for a milder word. It might further be questioned whether or not "hate" is the true opposite of love. The attempt was made to secure some

[14] The Association Method, A. J. of P. 21, 1910. Pp. 223 ff.

introspections on these points from those who experienced special difficulty, but without success. When asked what was in their minds at such pauses, the subjects usually replied "nothing." Of course they were untrained observers and could not throw much light upon the problem. It is not unreasonable, however, to suppose that a conflict may have been present, though the subject was not aware of its significance.

The following list, compiled from the records of 137 students taking the test for the first time during the years 1913-14 and 1914-15, shows the effect of the ambiguities. In the case of the two words "come" and "love" are included some of the incorrect responses in order to show how frequent is the tendency toward incorrect responses.

above	under 7 times
slow	quick 4 times, swift 1 time
front	behind 6 times; rear 4 times
dead	living 3 times
open	closed 8 times
come	went 14 times; gone 7 times; stay or stay away 6 times
empty	filled 1 time; vacant 1 time
far	close 6 times
love	dislike 1 time; distaste 1 time; detest 1 time; disregard 1 time; good 1 time; ill 1 time; no response 13 times.

It will be noted that the majority of these undesirable words are found in the Hard list. It is possible that its difficulties may be due to these words alone, and that when the ambiguous words in both lists are eliminated, they will be equal in difficulty.

The Opposites test, regarded as a measure of speed of mental processes, has proved acceptable in the present investigation. Reference to Table IV (p. 51) shows that this test ranks second in degree of correlation with all the tests combined. As one of a group of "speed" tests it has considerable symptomatic value. It calls for the exercise of a type of mental gymnastics quite common in everyday life, and in the experience of the ordinary person, the two ideas are so commonly coupled as to be almost automatic. Readiness of speech seems to demand such facility.

Test No. 11. Constant Increment[15] *i*

Materials: Card containing one hundred two-place numbers.

64	72	47	30
49	35	43	56
62	51	35	44
57	30	64	31
68	56	49	37
74	44	67	60
53	36	28	71
67	73	46	48
25	63	55	53
40	47	65	61
61	43	70	36
71	66	41	42
33	69	62	34
38	37	25	39
28	39	40	33
65	32	57	73
41	59	26	38
50	31	68	63
42	60	66	58
58	48	27	32
52	54	51	59
70	46	69	52
26	55	29	45
34	27	74	72
45	29	50	54

Directions: "I am going to give you a list of 100 numbers and shall ask you to add four to each number as quickly as possible, giving the sum aloud. You may practice on this list: 22, 34, 92. Begin at the top of each of the four columns and add four to each number. You need not be afraid to go fast, for the test is easy and you are not likely to make mistakes. You should be accurate, however, because every error will take off one point from your score. The main thing is to add as rapidly as possible."

Method of Scoring: Accuracy was scored by subtracting one unit for every error. The time is represented by the number of seconds required for the 100 additions. A net index was obtained by dividing the number of seconds by the accuracy score. Of the 40 students in this group, only 4 obtained perfect scores in ac-

[15] Woodworth and Wells, *op. cit.*, p. 47

curacy, but there were very few low accuracy scores, most of the errors numbering from two to five.

This test, like the preceding one, aims to measure reaction time for almost automatized response. It is easy to administer and easy to score, and when used in company with other measures of speed of mental processes, undoubtedly has some symptomatic value. However, the activity is rather highly specialized and is so patently influenced by practice that on the whole it is not recommended as desirable for a series of general utility. Its use with the present subjects was probably attended with less difficulty than with the ordinary academic group inasmuch as the members of this group had nearly all had considerable experience with adding. It is probable, however, that a less specialized type of activity would be preferable in measuring speed of mental processes. If use is made of the test in such measurements as this, the author suggests that one hundred additions is an unnecessarily large number to require. It is quite likely that twenty-five would give as useful a measure.

Test No. 12. Hard Directions[16] (Instructions printed) *i*

Materials: Blanks, like sample, laid face downward.

Directions: "On the reverse side of this paper will be found a series of directions which I wish you to carry out as rapidly as possible. The directions will require you to write certain words and to answer certain questions in spaces provided for the purpose. The object is to complete the work correctly as quickly as possible, so do not stop till you have finished."

Method of Scoring: The work was scored as to time and accuracy. Every error, of which twenty were possible, counted five off except the last direction where 2.5 was counted off for each wrong initial. A net index was secured by dividing the time by the accuracy. Fourteen of the 40 subjects scored 100 in accuracy.

With your pencil make a dot over any one of these letters, **F G H I J**, and a comma after the longest of these three words: **boy mother girl** Then, if Christmas comes in March, make a cross right here..... but if not, pass along to the next question, and tell where the sun rises.....

[16] Woodworth and Wells, *op. cit.*

If you believe that Edison discovered America, cross out what you just wrote, but if it was some one else, put in a number to complete this sentence: "A horse has.....feet." Write *yes,* no matter whether China is in Africa or not.....; and then give a wrong answer to this question: "How many days are there in the week?" ..... Write any letter except *g* just after this comma, and then write *no* if 2 times 5 are 10 ..... Now, if Tuesday comes after Monday, make two crosses here.....; but if not, make a circle here.....or else a square here..... Be sure to make three crosses between these two names of boys: George.....Henry. Notice these two numbers: 3, 5. If iron is heavier than water, write the larger number here....., but if iron is lighter write the smaller number here..... Show by a cross when the nights are longer: in summer?.....in winter?..... Give the correct answer to this question: "Does water run uphill?" ..... and repeat your answer here..... Do nothing here (5+7=.....), unless you skipped the preceding question; but write the first letter of your first name and the last letter of your last name at the ends of this line:

Two difficulties are to be found with the test in its present form. It was found by experimenting with a preliminary group of subjects, that there was a tendency to misinterpret the first direction. Several persons thought they were to place a dot over the five letters whenever they appeared in the entire text. Accordingly the precaution was taken to draw a line through this direction in giving the test to the college students being studied. The test is also embarrassed by the fact that the last direction, as printed on the blanks now available is open to misinterpretation. The line at the ends of which the subject is asked to place his initials, resembles a decoration on the page. By far the greater number of subjects so regarded it, and placed their initials at the end of the printed line after the colon. Accordingly the position of the initials was disregarded in scoring.

This test seems to demand more than mere ability to follow directions. Most of the tasks are of such a nature that they can

not be performed according to the first suggestion. The impulse is checked by a conflicting or alternate command. Accordingly the activity seems to partake largely of the nature of a resistance to suggestion, or of any effort to resist impulses. In comparing the reactions of individual students to this test, it was noticeable that those who had exhibited the power to "hold their heads" in distracting circumstances stood high in this test, while those of opposite tendency were seriously disturbed. It gives opportunity to observe the student under trying circumstances, and throws considerable light upon his habits of attacking new situations.

Test No. 13. Directions. (Oral)

Materials: Two pieces of type-writer paper folded ready for insertion in a long envelope. Electric switch-board in two rooms; in the ante-room, a clock, table, book, one chair on which assistant is seated.

Directions: "I am going to give you a series of tasks which I wish you to execute as quickly and correctly as possible. There are a number of things to be held in mind, so listen to the directions very carefully."

1. Go to the room at the end of the hall and lay this paper on the chair.
2. Then hide this paper where it can not readily be found.
3. Then open switch number six.
4. Then look at the clock and see what time it says.
5. If it says it is after ten o'clock, leave the door open as you come out .
6. Bring me a book off the table.

Be as quick as possible and do not ask any questions. On his return, the subject was asked what time it was by the clock.

Method of Scoring: The accuracy with which the directions were carried out was scored on the basis of 100 by giving a credit of 16⅔ for each task. The net index was found by dividing the time by the accuracy. Only eight of the forty subjects performed the tasks exactly as directed. There is a question as to what is the fairer method of scoring. Should the basis be speed or accuracy? Though a combination of both was

adopted, some doubt was entertained as to the justice of the plan. Scores in speed and accuracy show no positive correlation (—.11). Furthermore the accuracy scores vary widely —from 50 to 100—and one would suppose that the low scores would prevent a high correlation between scores in speed and index. The correlation seems surprisingly high, however, being .95. Thus it appears that the rather low scores in accuracy did not seriously alter the standing of the individuals with respect to speed. As final evidence that the net index as thus obtained does measure speed, is the fact that scores in speed of carrying out printed directions correlate with those in the oral test by .23, and the indices of the two tests correlate with the same coefficient. Of course this still does not answer the question as to whether accuracy would not be a truer measure of this ability.

Memory plays a rather important part in the oral directions test. Success in it demands that one retain a number of details in a certain order. It also requires the ability to "hold one's head" in spite of distractions. Several distractions were introduced such as might occur in any business situation. With reference to the first direction there was only one chair in the room, and the assistant was seated on that. This disturbed many of the subjects. All were obliged to make quick decisions as to what disposition they should make of the paper. Some obeyed the instructions implicitly and asked the assistant to rise; others tucked it behind her. Still others, however, made no attempt to obey the direction and deposited the paper on the table. A further distraction was presented in making the closing of the door contingent upon the time as told by the clock on the table. The hands of the clock were always set at 10:30 and it did not run. The surprise encountered here caused some to forget the instructions about closing the door. The peculiar wording given to this direction was also slightly disconcerting. Lastly there were twelve switches in a row, and it was necessary to remember which one to throw off. The whole situation called up by this test serves to throw considerable illumination upon the way a person meets novel and complex situations.

The experience with this test shows need for several changes.

It would be better to have all the tasks performed in the same room and to dispense with the need for an assistant. The direction about the time of day might well be omitted. It was found that some subjects did not look at the clock, reporting, when they came back to the test-room, that they got the time from their watches. Of course this counted against the score, constituting a deviation from the directions, but it should be omitted from the test because it offers opportunity for misinterpretation.

Test No. 14. Word-building[17] *g*

Materials: Blank sheet of paper with capital letters, B, M, T, A, E, O across the top laid face-downward upon the desk.

Directions: "On the reverse side of the paper before you are six letters which I wish you to use in building words. Make as many words as possible from the six letters. For example, out of the letters e, a, r, i, l, p, you might form words like rap, lip, etc. You may use any number of letters from one to six, but no other letters than these six are to be used. Any English words will do—proper names, interjections: only be sure that they fulfill the above conditions. Five minutes will be given."

Test No. 15. Sentence-building.[18] *g*

Materials: Blank paper and pencil.

Directions: "I will give you five minutes in which to make as many sentences as possible containing three words which I will give you presently. For example, if I gave you the words *money, river, Chicago,* you might make a sentence like this: "Chicago spends much money improving its river." You may use either singular or plural forms of the words, nominative, objective or possessive case. Simply use all three of the words in a sensible sentence and make as many different sentences as possible. The three words are *citizen, horse, decree.*"

Method of Scoring: The score represents the number of sentences formed.

Tests No. 14 and 15 suffer under the handicap of small range of scores. The steps between the scores are too large to reveal slight differences in achievement. In the cases of the sentences, the papers which contained a relatively large number of sentences

[17] Whipple, *op. cit.*, p. 441 ff.
[18] Whipple, *op. cit.*, p. 436 ff.

necessarily showed much sameness in subject-matter and structure.

Both these tests call for a certain amount of ingenuity and alertness. They are probably influenced somewhat by the size of the vocabulary at the command of the subject. The amount of work done in each of these five-minute periods is small in comparison with the length of time devoted to the tests. It would be desirable to arrange tests that allow greater amount of work to be performed in comparison with the time devoted to it. The results of the two tests do not correlate very highly with each other, as is shown by Table III p. 50. They hold similar positions however, in correlation with the scores of the tests combined.

Test No. 16. Business Ingenuity *g*

Materials: Mimeographed copies of the following "problem."

Mr. A. is in the manufacturing business—manufacturing knit underwear. He inherited the business from his father who was sole owner and proprietor. On the death of the latter, which occurred a year ago, the business, which aside from the homestead comprised the entire estate, passed into the hands of Mr. A., Jr., and his sister.

The elder Mr. A. had conducted the business for forty years with remarkable success. Under his wise and careful management it had grown from a small work-shop employing a dozen persons, to a plant of considerable proportions. Its employees now number 250; there are 10 salesmen, and the product of the mills is surpassed in quality by none on the market.

Although the plant had expanded greatly under the guidance of its founder, still for the past 10 or 15 years it has just been holding its own. Rival firms have been making great inroads upon its trade. The old gentleman scorned the artifices of modern advertising and otherwise refused to make any concessions to the cheaper trade, depending upon the continued excellence of "Excelsior" brand goods to win. Consequently, at his demise, the business was paying only moderate dividends.

With the removal of the powerful personality that had always dominated the affairs of the "Excelsior Knitting Mills," business fell off alarmingly. Salesmen daily reported the loss of old customers. The best salesman of the force tendered his resignation, having accepted a position with a rival house. Furthermore, Congress recently raised the tariff on raw wool, thus increasing the cost of production. In addition to these reverses, Mr. A. has been experiencing considerable financial pressure for several months. It is now the middle of January, and he is facing a crisis. Last summer, being hard pressed by his importing house for settlement of an overdue bill for raw material, he had gone to the bank and borrowed $8,000, giving two notes

for $4,000 each, one due in six months, and the other, in one year. The first note falls due February 1, two weeks off. He had expected to meet this obligation in February with remittances from his customers, who by this time should have turned over a great part of their winter stock. In this he was disappointed, however, as collections are extremely slow of late, being barely sufficient to cover the pay-roll. And now as Mr. A. sits at his desk, pondering over the difficulties that confront him, the aged bookkeeper who had served the firm for 25 years enters and sadly lays before him a statement from the bank, showing an overdraft of $900 for the last payroll. This is especially ominous, as another payroll is due in two weeks. Mr. A. greatly dislikes to shut down the factory. It constitutes the chief means of support for the town of 2,500 inhabitants. A severe winter is at hand, and it would work great hardship upon many families to throw his force out of work at this time. Besides, to close the factory would be disadvantageous to the business itself in more ways than one.

As Mr. A. studies the situation in all its phases, he sees that it is not perfectly hopeless. He has buildings and grounds worth $75,000, machinery and equipment worth $30,000—all in good condition. His books show bills receivable, amounting to about $10,000, but it should be said in explanation of this that he fears to collect any part of it by pressure, inasmuch as it has been his father's policy to be very lenient with his customers, and since patronage has already fallen off so markedly within the past year, he dares not risk any more defection by drastic collection proceedings. Perhaps his most valuable asset is the "Excelsior" trade-mark and the untarnished reputation of the house. This and other features of the situation give him encouragement, and he seeks the best course to follow.

There are several ways in which this situation might be met. Describe *briefly* all the solutions you can think of, any one or all of which might be used not only (1) to meet the present crisis, but also (2) to put the business on a good running basis.

Directions: "Study the contents of this paper carefully and obey the directions given in the last paragraph. There is no time limit."

Method of Scoring: Caution was observed in scoring the results of this test, to eliminate any bias in evaluating answers. It would plainly be unfair for the experimenter to set a value arbitrarily upon each possible solution, as such evaluation would be based upon wider experience than that possessed by the members of the group tested. Neither would a mass judgment made by financial experts furnish an adequate standard. The fairest way seemed to be to count all the solutions offered and to grade each paper with respect to the judgment of the total group. This was accomplished by tabulating every solution offered and counting the number of times it was offered. The number of different

solutions offered was 46. Each of these was mentioned from 1 to 56 times by the 68 persons who took the test the first year. For example, 58 persons suggested "advertising campaign" along modern lines"; 45 suggested "mortgage some property"; one person suggested that the factory be closed temporarily, etc. The 46 solutions were offered altogether 363 times. In order to grade on a basis of 100, 100 was divided by 363, leaving .275 as a unit. It was then easy to evaluate the different solutions by multiplying the number of times each was mentioned, by .275. Thus the reply "advertising campaign" received a value of 15.9; "mortgage property," 12.4; "close factory, .275, etc. Each paper was then scored by crediting each solution with the value which the combined judgments of the entire group placed upon it.

NAME

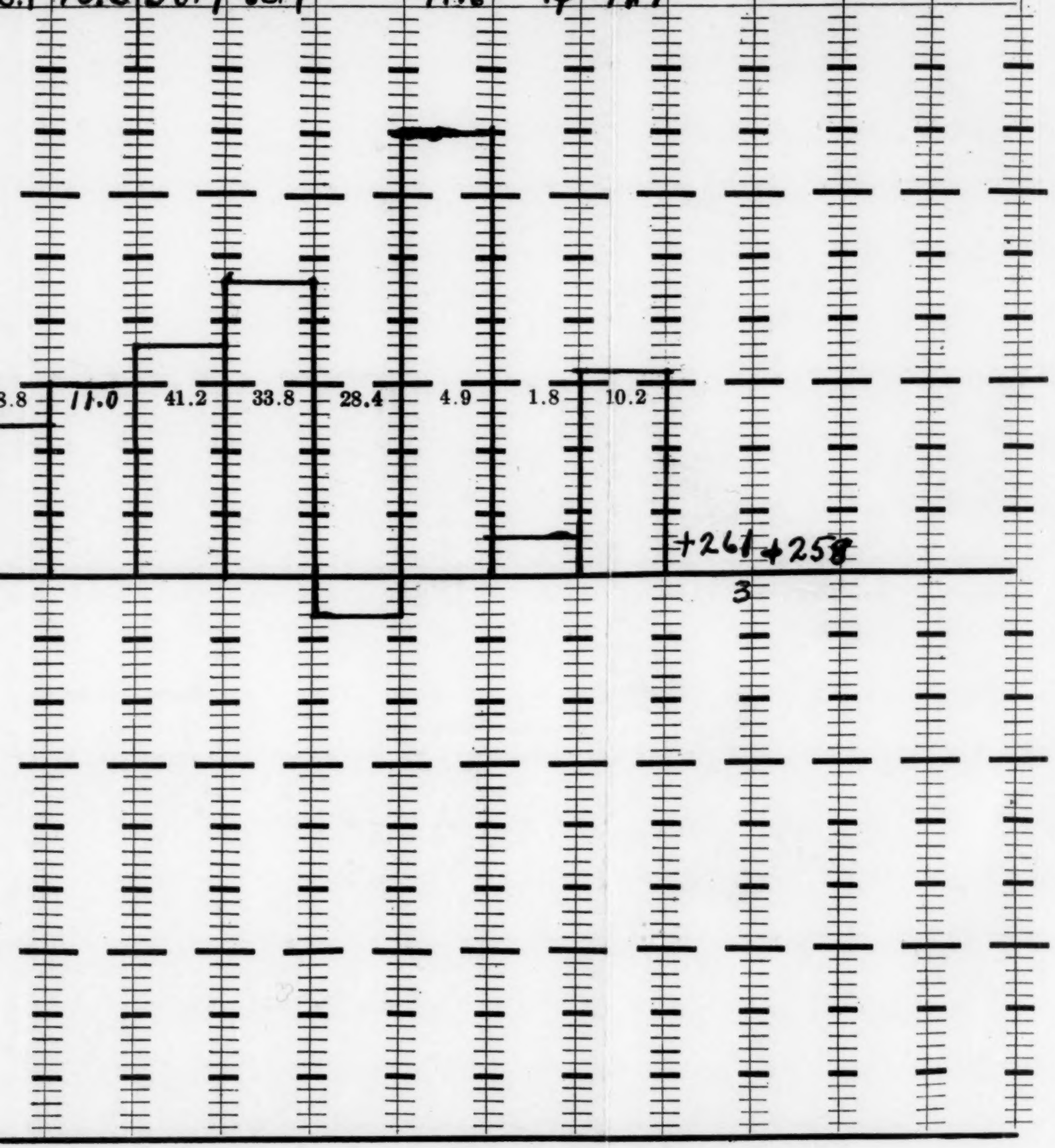
	1	2	3	4	5	6	7	8	9
Test	Numbers Checked	Numbers Heard	Objects Seen	"Ideas" Reproduced Immediately from Hearing	Ditto after 2 Weeks	Ditto from Sight Immediately	Ditto after 2 Weeks	Loss in 5	Loss in 6
Highest	100	10	10	88	91	93	100	0	0
Lowest	46	7	5	30	0	31	0	73	85
Average	69.2	8.4	7.6	71.0	56.2	77.2	63.9	15.8	16.1
Score	88	9	9	88	91	86	95	0	0
Dev. −									
Dev. +	18.8	1	1.4	17	34.8	8.8	31.1	15.8	16.1
1σ	12.1	1.0	1.2	11.1	23.7	14.0	24.0	19.0	18.8

3σ

2σ

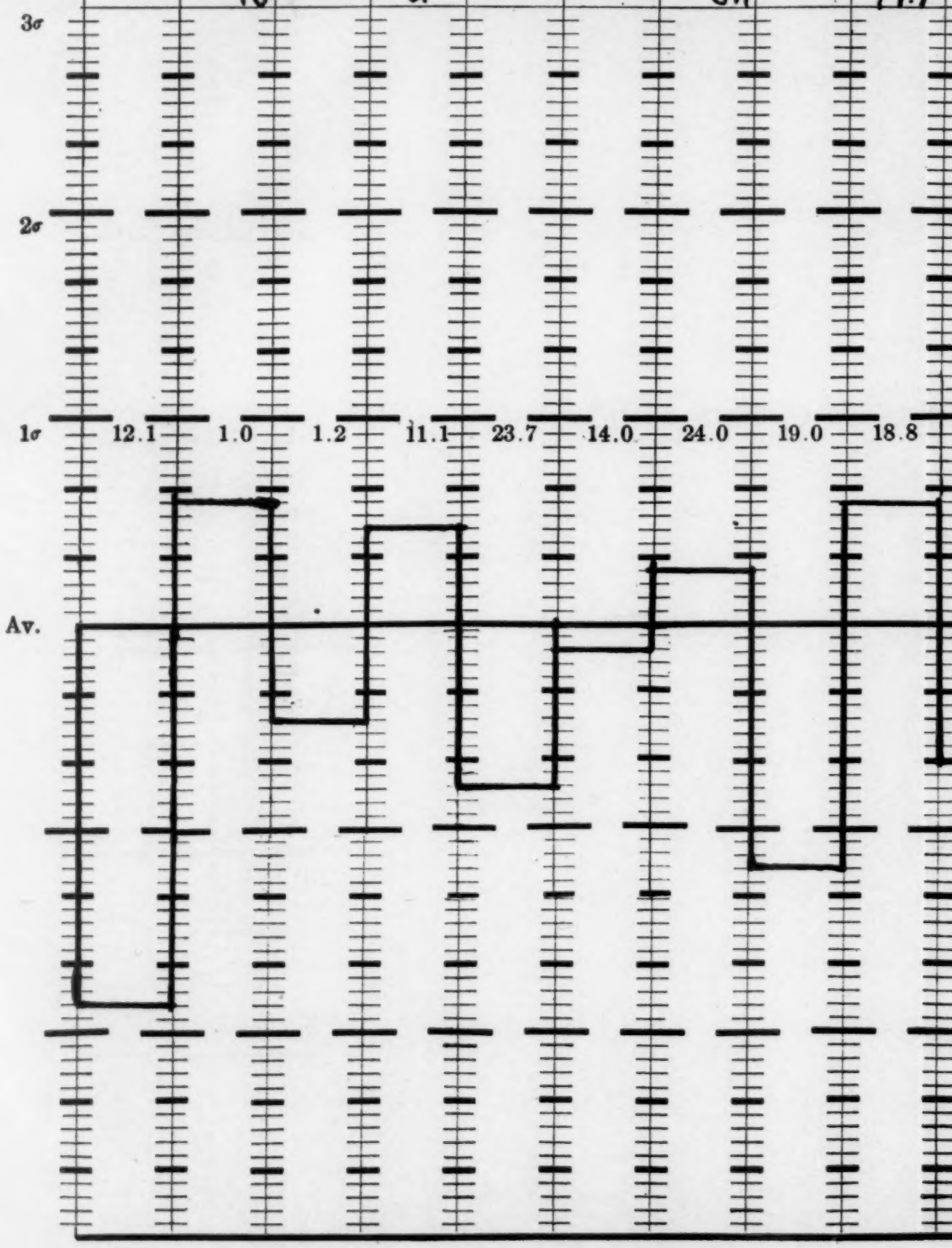
Av.

9	10	11	12	13	14	15	16	17	18	19	20
s in 6	Opposites	Constant Increment	Instructions Printed	Instructions Oral	Words Built	Sentences Built	Business Ingenuity				
0	34 sec.	73 sec.	37 sec.	19 sec.	33	12	60				
5	74 "	290 "	184 "	194 "	11	3	14				
6.1	52.6 "	139.7 "	110.9 "	58.2 "	21.4	6.6	35.9				
0	42	89	60	64	33	7	47				
				5.8							
6.1	10.6	50.7	50.9		11.6	.4	11.1				

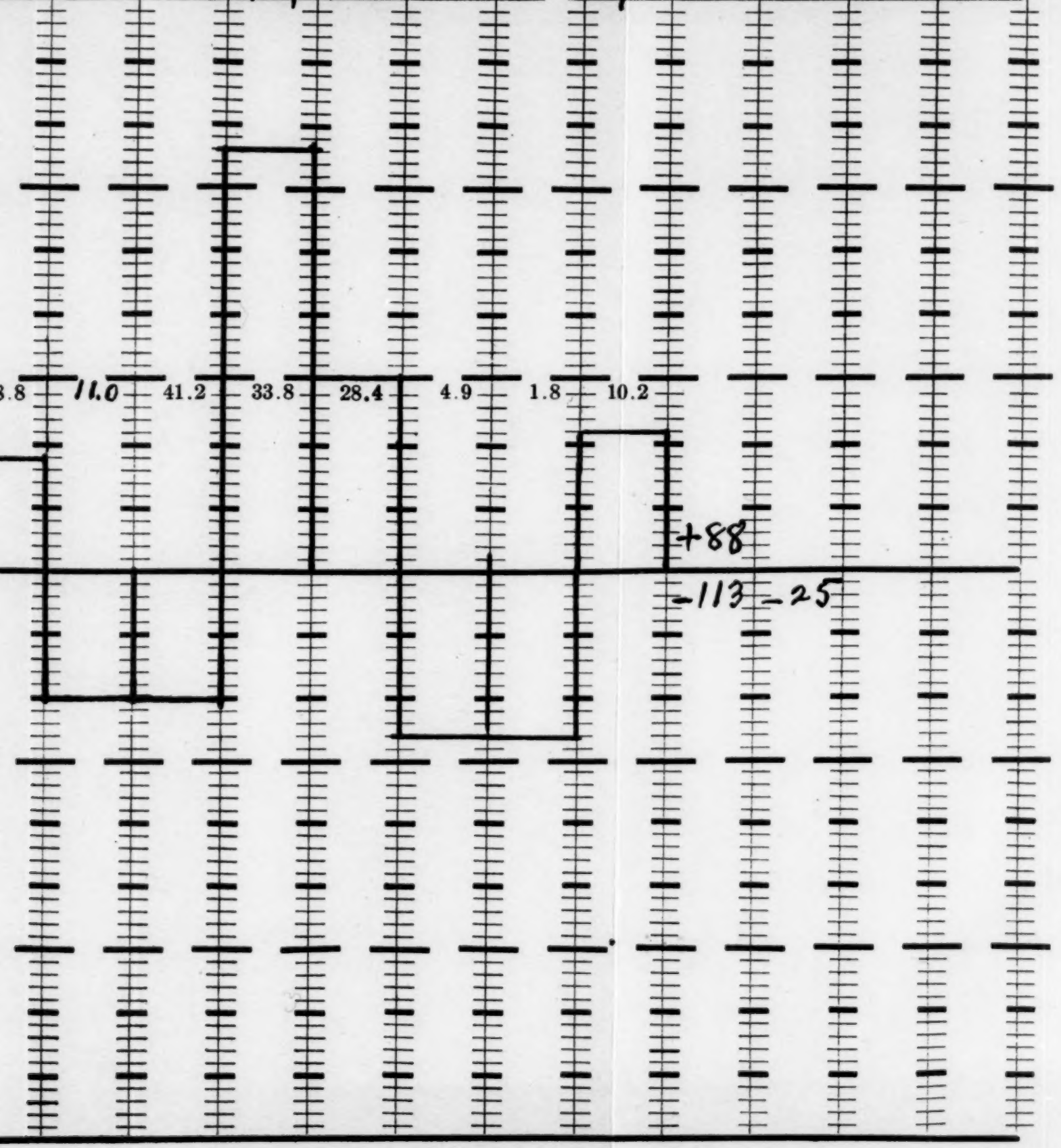


NAME .

Test	1 Numbers Checked	2 Numbers Heard	3 Objects Seen	4 "Ideas" Reproduced Immediately from Hearing	5 Ditto after 2 Weeks	6 Ditto from Sight Immediately	7 Ditto after 2 Weeks	8 Loss in 5	9 Loss in 6
Highest	100	10	10	88	91	93	100	0	0
Lowest	46	7	5	30	0	31	0	73	85
Average	69.2	8.4	7.6	71.0	56.2	77.2	63.9	15.8	16.1
Score	47	9	7	76	37	75	70	39	5
Dev. −	22.2		.6		19.2	2.2		23.2	
Dev. +		.6		5.			6.1		11.1



9	10	11	12	13	14	15	16	17	18	19	20
s in 6	Opposites	Constant Increment	Instructions Printed	Instructions Oral	Words Built	Sentences Built	Business Ingenuity				
0	34 sec.	73 sec.	37 sec.	19 sec.	38	12	60				
5	74 "	290 "	184 "	194 "	11	3	14				
6.1	52.6 "	139.7 "	110.9 "	58.2 "	21.4	6.6	35.9				
5	60	172	37	30	17	5	43				
	7.4	32.3			4.4	1.6					
1.1			73.9	28.2			7.1				



NAME

	1	2	3	4	5	6	7	8	9
Test	Numbers Checked	Numbers Heard	Objects Seen	"Ideas" Reproduced Immediately from Hearing	Ditto after 2 Weeks	Ditto from Sight Immediately	Ditto after 2 Weeks	Loss in 5	Loss in
Highest	100	10	10	88	91	93	100	0	0
Lowest	46	7	5	30	0	31	0	73	85
Average	69.2	8.4	7.6	71.0	56.2	77.2	63.9	15.8	16.1
Score	62	7	7	34	0	62	37	34	25
Dev. −	7.2	1.4	.6	37	56.2	15.2	26.9	18.2	8.
Dev. +									
3σ									
2σ									
1σ	12.1	1.0	1.2	11.1	23.7	14.0	24.0	19.0	18.8
Av.									

9	10	11	12	13	14	15	16	17	18	19	20
Loss in 6	Opposites	Constant Increment	Instructions Printed	Instructions Oral	Words Built	Sentences Built	Business Ingenuity				
0	34 sec	73 sec.	37 sec.	19 sec.	33	12	60				
85	74 "	290 "	184 "	194 "	11	3	14				
16.1	52.6 "	139.7 "	110.9 "	58.2 "	21.4	6.6	35.9				
25	62	155	119	59	22	6	19				
8.9	9.4	15.3	8.1	.8		.6	16.9				
					.6						
18.8	14.0	41.2	33.8	28.4	4.9	1.8	10.2				

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CHAPTER IV

Psychological Norms for College Students

Before employing this series of tests for purposes of practical diagnosis it was obviously necessary to establish norms of performance. The figures for such norms were obtained from the records of the first group to whom the tests were given. As described in Chapter II, forty students were found who had complete records, and the averages and medians for this group are shown in Table I.

TABLE I

Average and Median Score made in each test by 40 subjects.[19]

		Average	m.v.	Median
No.	1	69.2	10.3	71.5
"	2	8.4	.8	8
"	3	7.6	.9	7
"	4	71.0	8.2	74
"	5	56.2	18.6	61
"	6	77.2	10.5	79.5
"	7	63.9	20.1	63.5
"	8	15.8	15.0	9
"	9	16.1	15.4	8.5
"	10	52.6	8.8	53.0
"	11	139.7	32.0	135.0
"	12	110.9	26.7	105.5
"	13	58.2	17.6	54.5
"	14	21.4	4.1	22
"	15	6.6	1.4	7
"	16	35.9	8.6	37.5

In view of the practical use to which the records were to be put, it was desired to present each student's record in graphic form Accordingly a chart was arranged (see opposite page), which provided for graphic representation and at the same time gave means of combining the scores in the several tests so as to furnish a figure representative of the student's standing in all combined. Accompanying each graphic record were remarks of an interpretative nature, for in addition to the numerical results

[19] For further information regarding the distribution of these measures, see chart for individual records showing highest and lowest scores in each test.

obtained by psychological examination, it is also possible to secure much knowledge concerning the mental characteristics of an individual which are not expressible in numerical terms, but nevertheless are of considerable value in understanding his case.

As already stated, the graphic chart was arranged with two ends in view—first, to permit a clear and easily read presentation of the student's standing in each test, in other words, to show the distribution of his mental traits; second, to furnish a net score combining his standing in all the tests according to the third requirement set by Stern. The chart was constructed on the following plan: Each test, numbered from 1 to 16, is given a vertical column. Below the name of each test appears the highest score made, the lowest score, and the average. Below this, is inserted the score of the individual, and below this, the amount of his deviation from the average, either plus or minus, according as the deviation is meritorious or the opposite. Two-thirds of the distance down the vertical column is a figure which represents the Standard Deviation for the measures. Approximately in the middle of the chart is a heavy horizontal line. This represents the average and is the base line from which all deviations are measured. Each vertical column is divided into three large divisions on either side of the average line, and each of these divisions has three subdivisions which are again divided into five steps each. The gross divisions represent one, two and three times the Standard Deviation. An illustration will make clear the use of the Chart. Suppose a subject scores 89 in test No. 1. This means a deviation of 20 above the average (69.2). Twenty is once the Standard Deviation (12.1) and two-thirds as much again. Hence one large division is marked off and two-thirds of another. Counting in terms of the smallest subdivisions, the standing of the individual in the test is twenty-five units of deviation above the average. These units are equal throughout the series of tests, for the Standard Deviation[20] bears the same

[20] The Standard Deviation σ was used in this case according to the formula $\sigma = \frac{\sqrt{\Sigma(d)^2}}{n-1}$ where d= deviation from the average, Σ= the sum and n= the number of cases (40). Another measure of variability could probably be used as well. The chief aim is to have a relation that is constant between average and individual measure in all tests.

relation theoretically to the average score in each test. The net score for each individual is obtained by adding the units of deviation above the average and those below the average, and subtracting the smaller from the larger sum. The number thus secured is the plus or minus score of the individual and gives numerical basis for designating his rank in the group. It should be kept in mind that these quantitative expressions of performances in the tests serve in no way to express the mentality of the individual in absolute terms. The net score is merely a resultant value of all the tests in the series, and meets the third requirement set by Stern. In its essential nature, however, it is only a relative measure and places the individual only with respect to the other members of his group. The ranking of the subjects on the basis of net score is shown in Table II.

TABLE II

Net Scores representing standing in 16 tests pooled for 40 individuals.

+259	— 14
+135	— 18
+119	— 29
+106	— 30
+ 81	— 31
+ 75	— 39
+ 73	— 45
+ 67	— 53
+ 65	— 61
+ 65	— 66
+ 64	— 77
+ 63	— 82
+ 44	—102
+ 41	—107
+ 41	—116
+ 32	—131
+ 31	—160
+ 20	—237
+ 18	—255
+ 17	
+ 3	

These net scores when arranged from highest to lowest follow the normal curve of distribution, twenty-one being above and nineteen, below the average. The extremes are also approximately at the same distance from the average. In examining the individual charts, it is found that they range from conditions where the deviations in all the tests are almost entirely above the average to conditions where the deviations are practically all

below the average. By far the greater number of individual charts, however, show the deviations to be partly above and partly below the average. This is as might be expected in view of what is known about the distribution of mental traits in most individuals. Inasmuch as it is impossible to present all the individual charts, three samples are shown—representing the three types of distribution (p. 45).

It will be noted that the construction of the chart assumes that the tests are equal in their demands upon intelligence on the average.[21] This does not mean, however, that memory for digits, for example, is equal to speed of giving logical associations, but that the amount of deviation proportional to the Standard Deviation in one test is equal to the same amount of deviation proportional to the Standard Deviation in another. This assumption seems justified in view of the relativity of the measures, and the fact that the unit of measure is based upon the Standard Deviation for all tests, which presumably holds a constant relation to the several averages. Another assumption on which the chart is based is that excellence is always to be found on the plus side of the base line. It assumes, for instance, that to have a poor memory for objects visually sensed is a psychical dereliction. This may appear to be unwarranted, inasmuch as a person may have poor ability to reproduce what he has visually apprehended, and still display marked intelligence. He may, for example, have habituated himself to some other form of sense impression. A similar assumption penalizes slowness of response, making it appear that the individual who is slower than the average has less intelligence, whereas some psychological doctrine regards speed as purely a matter of individual variation. These practical questions involve weighty problems regarding the theory of intelligence and this is not the place to discuss them. Still it is pertinent to suggest that in the long run, for meeting practical situa-

[21] For discussions of similar methods of amalgamating scores see R. S. Woodworth. Statistical Method, Psychol. Rev. 19, 1912, pp. 97-123; A. P. Weiss, A. Modified Slide-rule and the Index Method in Individual Measurements, J. of Educ. Psychol. 5, Nov. 1914; A. R. Abelson, The Measurement of Mental Ability of Backward Children. Brit. J. of P., 1911, 4, 268-314; W. Stern, Differentielle Psychologie, Barth, Leipsig, 1911. p. 17 ff.

tions in life, the most serviceable type of mind is that which shows excellence in each of these divers powers. Furthermore, according to the trend of thought and practice regarding mental tests, such varieties of excellence are provided for by the use of a large number of tests, and the increase in the number of different traits tested minimizes the danger of specialization. This introduces what Stern characterizes as a "systematic compensation"[22] mechanism which provides for qualitative differences in the same degree of intelligence. Some justification for this view is furnished by the fact that the measures in Table II conform to the normal curve of distribution; and further justification for the method will appear when the results of the pooled tests are compared with judgments of mental ability.

Inter-test Correlations

In attempting to show the relations among the results of a series of tests the method of correlation has been much employed. The results of different tests are compared and the degree of correspondence is stated in terms of a "correlation coefficient" which is the "measure of the tendency towards concomitant variation exhibited by two series of phenomena and hence throws some light upon the causal relations of these phenomena."[23] Adopting this method, a number of correlations were computed between results of tests that might be expected to be closely related. The correlation coefficients are shown in Table III. Considering a correlation high only when its coefficient is four or five times as large as the P. E., a significant positive correlation appears only between (1) memory for meaningful material seen and heard, (2) between the first and second reproductions of this material, and (3) between the Opposites and Constant Increment tests. Further inter-test correlations were abandoned because at this stage of the work it seemed more profitable to direct the major attention to other phases of the problem. Other recent investigators have evinced considerable dissatisfaction with dependence upon inter-test correlations in judging the validity of a series of

[22] *Op. cit.*, pp. 21, 22.

[23] Wm. Brown, The Essentials of Mental Measurements, Cambridge, University Press, Cambridge, 1911. p. 47.

tests.[24] It is clear that a high degree of correlation should not be expected if the series is a good series calling for varied mental processes. In the present series some of the tests stress memory of various kinds, others, reasoning processes, some call chiefly for display of originality and initiative in various fields, others emphasize sense differences. They vary also in amount of motor activity involved. For these reasons if a high degree of correlation were found among all the tests, their value might be seriously questioned; one would be inclined to doubt that they reached different phases of mentality. Therefore, in a series such as this, a certain variety is a virtue, first because it helps to give a more comprehensive view of the qualitative distribution of mental traits in any individual; second, because when a person holds a decidedly high or low position in several tests, the reliability of the measures increases with every deviation that follows the general trend.

TABLE III

Inter-test Correlations Camputed by the Product- Moment Method[25] (Raw)

	r.	P.E.
Number-checking and Hard Directions (printed)	.01	.10
Numbers Heard and Objects Seen	.09	.10
Numbers Heard and Directions (oral) (accuracy)	—.05	.10
Numbers Heard and Logical Material Heard	—.09	.10
Objects Seen and Logical Material Seen	—.13	.10
Logical Material Heard and ditto seen (immediately)	.26	.10
Logical Material Heard and ditto seen (deferred)	.54	.07
Loss in Logical Material Heard and ditto Seen	.54	.07
Logical Material Heard (first and second reproductions)	.49	0.8
Logical Material Seen (first and second reproductions)	.45	.08
Opposites Easy and Hard (Speed)	.46	.08
Opposites Easy and Hard (accuracy)	.51	.07
Opposites Easy (speed) and combined Index	.84	.03
Opposites Easy (index) and combined Index	.84	.03

[24] *Cf.* Abelson, *op. cit.* In a series of tests similar to these this author found the inter-test correlations of little interpretative value, and was obliged to use other means of evaluation, employing Spearman's valuable method of pooling. This author concluded that the differences among the tests are negligible anyway, and that they are "about equally accurate measurements of general ability." p. 302.

Also *cf.* E. Webb, Character and Intelligence, Brit. J. of P., Mon. Sup. Vol. I, No. 3, p. 83.

[25] According to the formula $r = \frac{\Sigma(xy)}{n\sigma_1 \sigma_2}$

Opposites Hard (index) and combined Index	.86	.03
Opposites Easy (speed) and Constant Increment (speed)	.40	.08
Opposites Easy (accuracy) and Constant Increment (accuracy)	.10	.10
Opposites Combined Index and Constant Increment Index	.38	.09
Hard Directions Printed (Speed with accuracy)	.36	.09
Hard Directions Printed (Speed with index)	.84	.03
Hard Directions Printed and oral (speed)	.23	.10
Hard Directions Printed and oral (accuracy)	—.02	.10
Hard Directions Printed Index and Oral Index	.23	.10
Hard Directions Oral (speed and Index)	.95	.01
Hard Directions Printed (speed and accuracy)	—.11	.10
Word-building and Sentence-building	.05	.10
Word-building and Business Ingenuity	.10	.10
Sentence-building and Business Ingenuity	—.02	.10

Abandoning the search for the significance of inter-test relationships, further observation of the measures reveals a peculiar phenomenon of mental life. It has been found by several investigators that measures secured from several tests, though singly not correlating highly with other series of measurements, nevertheless, when amalgamated may correlate highly with other series. This phenomenon has been noted and discussed by Abelson,[26] who, by a process of pooling, showed that averages from a number of tests which taken singly, showed little correlation with other measures of ability, nevertheless, when pooled, correlated with a high magnitude. As explained earlier in the chapter the method of graphic representation furnished a way to combine the scores made by an individual in the several tests, and to express the standing in all the tests in a single net-score. The net-scores made by the forty persons in the experimental group were correlated with their scores in each of the tests and it was found that much higher correlations obtained than between the scores of the separate tests. The results appear in Table IV.

TABLE IV

Correlation of Standings in Each Test with Standings in Net Score.
(Method of Rank Differences[27])

		ρ	P.E.[28]
Test No. 7	Logical Material Seen Deferred	.60	.07
" " 10	Opposites	.53	.08
" " 12	Hard Directions (printed)	.49	.08

[26] *Op. cit.*

[27] According to the formula, $\rho = 1 - \frac{6\Sigma(d)^2}{n(nxn^2 - 1}$

[28] According to the formula P.E. $= \frac{.7063(1-\rho^2)}{\sqrt{n}}$

"	"	3	Objects Seen	.48 .08
"	"	9	Loss in Logical Material Seen	.47 .09
"	"	5	Logical Material Heard (deferred)	.45 .09
"	"	14	Word-building	.45 .09
"	"	8	Loss in Logical Material Heard	.43 .09
"	"	15	Sentence-building	.42 .09
"	"	11	Constant Increment	.38 .10
"	"	16	Business Ingenuity	.33 .10
"	"	6	Logical Material (immediate)	.29 .10
"	"	2	Numbers Heard	.27 .10
"	"	13	Hard Directions Oral	.23 .11
"	"	4	Logical Material Heard (immediate)	.23 .11
"	"	1	Number-checking	.18 .11

In view of the uncertainty attending the meaning of inter-test correlations, it seemed wise, as Stern[29] suggests, "to seek the means of gauging the tests in some criterion that lies outside of the experiment." As has already been shown, the conditions surrounding this investigation furnished unusual opportunity for linking up the results with the other relations of the student. Of course much of the data gathered by the college office could hardly be reduced to mathematical terms. For example, it would be difficult so to treat judgments of employers and teachers and the information regarding social, and physical activities. These were for the most part in descriptive terms. One group of extra-laboratory measures readily available, however, consists of university grades and they will next be considered.

Correlations between College Grades and Results of Tests

The index of correlation between standings in university grades for the year 1913-14 and standings in the psychological examination was found to be .44 (P. E. .09) using the Pearson method adapted to rank differences. Though this is a positive correlation it can not be considered high. In terms of percentage, of the 20 individuals in the better half of the ranking according to grades, 13 or 65% are also in the better half of the ranking according to scores in the tests. The use of the same tests with the 1914 Freshmen gives opportunity for further correlation with university grades. This group furnishes 40 complete records. The scores made in the tests correlate with grades for the year

[29] *Op. cit.*, p. 115.

1914-15 by .20 (P. E. .11) using the Pearson method adapted to rank differences. Of the 20 individuals in the better half of the ranking according to grades, 11 or 55% are in the better half of the ranking according to the tests.

These results give point to the remark that the correlation between intelligence as measured by tests and academic standing is not so high as is popularly supposed. An analysis of the conditions of university life shows that many other factors besides intelligence enter in to determine class-room standing. One prominent source of error now under experimental scrutiny is the subjectivity of instructors' gradings. Another large group of factors may be traced to the student himself. Some of these have to do with will in the widest sense of the term. If a student shows decided ability in psychological tests and his university work is poor it may be found that his faults are in the direction of moral qualities. Or if a student achieves only moderate success in the tests but does distinctly good work in the university, then "there is a probability . . . that this pupil's strength is to be sought primarily in qualities of character and will."[30]

Still other conditions affecting the student's grades are social surroundings. Especially is this true when students live at home, and in the case of a city institution, this becomes a serious problem. Likewise economic conditions affect the student's grades. If he must earn his way through the university, it is manifest that his academic standing will be affected by the fact. On the other hand, if he has too much money at his disposal there is danger that his university work will suffer. A final consideration is the physical condition of the student. His bodily well-being colors largely his university work.

When one considers the complex conditions of the marking system in college or university, one is not surprised to find low positive correlation between the results of psychological examinations and college grades. This lack of correspondence blights some of the hopes cherished for psychological tests—the hopes that they may serve as entrance examinations, to foretell what kind of college work a student will do. Psycho-

[30] Stern, *op. cit.*, p. 64.

logical tests are meeting with such favor, and are proving so useful as indicators of mental ability that one can readily understand the desire to use them to sift out the undesirable applicants at colleges and universities. Such an arrangement seems especially desirable when one considers the large number of students who are dismissed at the end of their first term in college. In view of the deplorable waste involved in thus accepting students only to be dismissed as incompetent, it would be a great boon to humanity if psychological examinations could thus be employed. The gain would be both to the university and to the individual. Such sanguine expectations, however, will probably not be realized, for even with a perfectly flawless series of psychological tests, there is one group of factors that can not at present be measured—those things designated moral and volitional qualities.[31] A student might prove superlatively bright in his entrance examination, and still fail in academic work because he was not strong enough to withstand the allurements of extra-curriculum attractions. Furthermore, prophecies concerning the future would also be out of place because of the multitude of other factors discussed mentioned above. In truth, however, it must be pointed out that the present type of entrance examinations, based as it is, on strictly academic grounds, is not any more infallible in sifting out the undesirables as is evidenced by the number of eliminations that occur among Freshmen. It is not at all impossible that a system might be evolved that would employ both academic and psychological tests, and while the combination would not be absolutely perfect in designating fitness for college or university work, it should nevertheless be better than either kind alone.

Correlation with Estimated Intelligence.

In order to ascertain the value of the tests by another means, it was decided to rank the students according to their estimated intelligence. The method employed was as follows: The students in the first experimental group of forty were ranked ac-

[31] The recent work of Webb (*op. cit.*) suggests that future developments may disclose means of measuring some of these heretofore elusive characteristics.

cording to their University grades, then the dean was asked to correct this ranking on the basis of all the information at his disposal, so that the arrangement should represent standing in intelligence as purely as it was possible to abstract it. The question asked was, if all these students had an equal chance in other respects, how would, they rank in practical intelligence—intelligence being regarded as ability to adapt one's self to new situations?[32]

These two series of rankings correlate by .57 (P. E. .05) using the Pearson method adapted to rank differences. In terms of percentage, of the 20 students in the better half of the ranking according to estimated intelligence, 13 or 65% are in the corresponding half of the ranking according to the tests. It would have been desirable to make a similar comparison between these two measures of the 1914 Freshmen but the dean felt that one year of acquaintance was too short to permit satisfactory estimation of intelligence. Even with the first group of students, though the acquaintance at time of making the estimates was in no case less than one year and in some cases extended over two and three years, still considerable perplexity was experienced in deciding upon just rankings. One of the factors inimical to success in this work is the liability to bias by grades. Thus it happened that office contact is closest with those students who receive low grades. Quite without reference to the other facts of the situation one is prone to assume that such students are low in intelligence. Other factors entering into estimations of intelligence are differences in length of acquaintanceship, reticence on the part of individuals and the briefness of contact with the students. In spite of these well-recognized artefacts, however, the correlation is quite decidedly significant. It agrees closely with that found by Abelson[33] who, after pooling the results of nine tests and correlating them with estimates of intelligence, found a coefficient of .60 for girls and .56 for boys.

The main purpose of this report is not to advocate the adoption of this particular series of tests for use in educational guidance.

[32] Stern, *op. cit.*, p. 3.

[33] *Op. cit.*, p. 303.

Its prime concern is with the establishment of a method. Therefore little can be gained by statistical studies of the tests alone or in correlation with one or two external factors. The hypothesis is that the entire individual must be taken into consideration and that psychological measurements are an integral part of this all-round examination—not as absolute or self-substantiating values, but as measures coordinate in interpretative value with measures of the student from other aspects. In support of such a contention the best proof that can be adduced will consist in the demonstration of the usefulness of the tests in actual administrative situations. What service do they render in the concrete situations that arise in administering the education of individuals under conditions such as those described? The report of this practical trial of the tests will be given in Chapter VI. First, however, should be pointed out the possible uses of such tests with various college groups, and this will be assayed in Chapter V.

CHAPTER V

Comparison between College Groups

One of the most desirable benefits of a standard system of psychological examinations for college students is the opportunity for making comparisons between various groups of students. It is very desirable to measure the psychological differences between various entering classes, between various graduating classes, to measure the differences between the performance of a group during the Freshman year and performances at later stages of advancement, between students of various colleges, departments, etc. The effects of certain branches of the curriculum might also be studied, as well as the results of the teaching of various instructors.

The data at hand throw some light upon one question of immediate interest—namely, the determination by objective means, of the effect of university training upon the mental capacity of a group of students. In order to investigate this problem the members of the 1913 group who were still in the university and who varied around the Sophomore point by no more than three months, were retested in 1914-15. The group consisted of 21 persons; 16 were men and 5, women. The average age on October 1, 1914 was 20.0 years. On March 1, approximately a year from their former testing as Freshmen, these students were called together and examined with tests Nos. 1, 2, 14, 15 and 16. Tests Nos. 10 and 11 were given individually during the week March 1-6. It was impossible to use the other nine tests of the series for this second testing since there was danger that memories held over from the previous year might be of service. The scores made by the members of this group at two stages of development are shown in Table V, together with the average scores made by the same individuals as Freshmen.

TABLE V

Average Scores in 7 Tests Made by 21 Freshmen (1913)

Test No.	1	2	10	11	14	15	16
Av. score	72.2	8.2	52.8	141.5	21.6	6.6	37.2
M. V.	8.8	.8	4.0	34.8	4.9	1.4	8.5
P. E. of Av.	1.6	.2	.7	7.4	.9	.3	1.5

Average Scores Made by Above Group as Sophomores (1914)

Test No.	1	2	10	11	14	15	16
Av. Score	75.8	8.2	46.0	124.9	21.9	9.6	40.3
M. V.	13.5	1.0	7.8	32.4	4.0	1.4	7.0
P. E. of Av.	2.0	.2	1.4	6.0	.7	.3	1.2
Absolute Gain	3.6	0.0	6.8	16.6	.3	3.0	3.1
Percent Gain	5.0	0.0	12.9	11.7	.1	4.5	8.0
P. E. of Diff.	2.5		1.5	9.5	1.1	1.3	1.9

In the results of the second year's testing, there is no score below the corresponding score for the previous year. Improvement is shown in every test except in Test No. 2 (Numbers Heard). As a measure of the reliability of the difference between the two series of averages, it is necessary to refer to the probable errors of the differences. These are found to be less than the difference in every case except that of Test No. 14, showing that most of the differences can not be accounted for by mere chance. The certainty of a true difference is further evidenced by the fact that the differences between the two series of scores are in the same direction for all the tests.

The data do not show whether the improvement is due to influence of maturity or to general training. This question awaits investigation by use of control groups.

It is hardly possible from this limited amount of data to make a statement regarding the relative improvement in different mental traits. Attention is called, however, to the unchanged score in Numbers Heard a rote memory activity, which seemed less susceptible to influence by the factors operating during the year, whether they be related to maturing of ability or to university training.

The above figures represent improvement distributed among the various tests. Another view of this improvement may be secured by considering the net score made by each individual when his scores in the seven tests are pooled. Comparison be-

tween these two series of net scores for the two years shows a correlation of .88 P. E. .03. This high correlation, indicating that the individuals tended to keep the same relative ranking during the year, may signify two things. If there were no disturbing factors, this correlation coefficient might represent a reliability coefficient signifying that the tests give reliable measures of ability, inasmuch as a second measurement makes little change in the relative standings. There is a disturbing factor, however,—lapse of time, wherein the subjects were under university training among other environmental influences. This training had been quite similar both in quality and quantity. In view of this homogeneity of the group, then, the high correlation coefficient may indicate that the members of the group improved with relatively equal amounts.

It is to be regretted that the entire series of sixteen tests could not be used for the second testing, but it was felt that all but these seven would be colored by memories from the previous year. This predicament shows that in applying tests to this problem, care should be taken to choose tests that can be repeated without danger of memories being held over that might be of assistance. In cases where this is not possible, as in logical material to be reproduced, it will be necessary to arrange tests that are approximately equal in difficulty, interest-value, etc. Such tests await development in psychological laboratories.

Another feature to be developed is the preparation of charts for the presentation of individual records. It is necessasry to arrange these charts so as to show not only the relation of the scores to the average of the group, but also their relation to records of previous years. In the present study only one kind of record-blank was used—all norms with which to compare the individual records for graphic presentation being secured from the records of the first experimental group—predominantly Freshmen.

Considerable interest attaches to a comparison of the two Freshman groups that have been studied, and an attempt was made to compare their records. It was thought, however, that such a comparison would be valueless because the tests were

made during the middle of the school year (February) in the case of the first group, while they were made near the opening of the school year in the case of the latter group. This resulted in making the two groups different in that the first group had been subjected to a selective process and the poorer students, or at least, those with very low grades, had been eliminated to some extent at the end of the first quarter's residence. Furthermore, on the supposition that a short period of university training may produce improvement in general mental ability, the two groups would be otherwise unequal, the first group having received four months of university training of which the second group had not had the advantage.

It should be emphasized that such manipulation of date as that just described is not done for the purpose of securing answers to the questions posited at the opening of this chapter. The measures here presented are too few to permit such conclusions. The calculations have been made merely to exhibit the uses of the method and to show how such measures may ultimately serve.

CHAPTER VI

Training for Efficiency in College

The series of tests here described is not being urged as a flawless adjunct to university administration. The hypothesis merely sets forth the possibility that psychological tests may be useful in facilitating the educational guidance of college students. The proof of this hypothesis is difficult of presentation in quantitative terms. In the first place the results of educational practice must necessarily await the test of time before they reach their highest fruition. Second, at present there is no accepted standard for measuring the most important results of education such as improvement in moral strength, power of appreciation, etc. It is clear, then, that the value of psychological tests in this field can not be expressed by a single figure, nor by a set of figures. The data found in the preceding chapters are offered in order to show that there is some basis for favorable judgment regarding the method, and to give some idea regarding the significance of the tests as a series. The chief justification for the use of the tests, however, must be of a pragmatic nature—must come from the help they have given in the guidance of college students through an individualized course of instruction.

Before proceeding to an exposition of this angle of the case, another feature of the plan must be described. This consisted in supplementing the psychological examinations by a series of lectures on methods of study. These were given to the 1914 Freshmen and aimed to present economical and effective methods of studying Freshman subjects.[34] Methods of memorizing were discussed and were applied specifically to the preparation of lessons in German, history, public speaking, etc. Other topics considered were habits of attention, and phases of the learning process. Also, by way of securing a clearer conception of the learning process some instruction was given in elementary neu-

[34] See the author's book, How To Use Your Mind (Lippincott).

rology. These lectures served in some degree to aid the students in orienting themselves during the first few weeks of trying adjustment to university environment, and especially to university methods of instruction. In addition to these general discussions adapted to the entire Freshman group, individual conferences were held wherein those students who found themselves in academic difficulties were given advice adapted to their specific problems. In this analysis of academic difficulties the habits of the student were carefully studied and the psychologist pointed out erroneous and uneconomical methods of study and gave specific directions for the formation of more efficient habits of mental application. As may be expected the kinds of advice required were of great variety ranging from suggestions embodying simple methods of memorizing, to the arrangement of an entire daily schedule.

In these individual conferences it may easily be seen that the psychological examination records are of great service. For example, if a student is found to have developed more effective methods of immediate reproduction than methods of deferred reproduction his reviews may be arranged accordingly. Furthermore, the tests seem to give some notion as to the amount of work a student is capable of carrying advantageously—all in terms of comparison with the average performance of his group. The tests may thus be helpful in avoiding the overloading of slower students and in spurring on the more able but lazy students.

The handling of students under this régime of personal supervision might easily degenerate into charlatanism especially in view of the preliminary stage of development which psychological consultations enjoy at the present time. In order to guard against this the impression was conveyed that the psychological examinations simply reflected mental condition as it existed at the time the examination was made; that the tests were not perfect measures of innate mental capacity; that they were of service mainly in revealing the methods of mental application which had been developed in the preceding environment. Assurances were given that none of the measures were absolute, but that all were relative to the group of students as a

whole; that relief from an unfavorable situation might be expected to take the form of development of more efficient habits of mental application—an aim within the reach of all, and finally, that the Freshman year was the most advantageous period for the formation of these habits. The results of these conferences can obviously not be measured, but the students seemed to find them helpful, and in view of the impressibility of Freshmen it is probable that these methods served to impress upon the students the importance of the first year of college life more emphatically than could be done if they were left to learn in a hap-hazard manner.

Conferences on study methods are very expensive in time, and require the exercise of considerable psychological insight. The light that is thrown upon Freshman difficulties, however, gives ample justification for their adoption. Some of the atrocious methods of study revealed in such conferences would open the eyes of administrators to the fact that an enormous waste occurs in the education of college students and that much precious energy is misapplied. The psychological fallacies disclosed emphasize the need of having a consulting psychologist at the disposal of every college student. The possibilities of training for study have never been demonstrated but it is safe to predict that the education of the future will adopt it as one of its salient features. In such event psychological tests will constitute a necessary part of the machinery. It is now apparent that each part of the system herein described is dependent upon every other part.

One gratifying result of the system as operated for the past two years was the effect upon the attitude of the students. They welcomed the attempt to measure their mental capacity, seeing in it an expression of the desire to be of service, which the College of Commerce and Administration has steadily manifested, and they responded readily. The disciplinary value of the tests became evident in dealing with individuals who were suspected of wilfully slighting university work. Examination of their environmental conditions revealed nothing that could explain their academic delinquencies. When the records in the

psychological examinations showed them to rank on the average or above in the mental traits tested, the administrative officer felt justified in charging them with lack of application, and in the face of the objective evidence of the tests the students admitted the charge to be just. After the exposure of one or two such cases, careless students tend to be less secure in their excuses for poor college work on the grounds of lack of ability. On the whole a very desirable frankness has been engendered between the students and the administrative office since the adoption of the methods herein described.

One unique function served by these records remains to be mentioned. Owing to the objectivity of this kind of measure, the rulings of the university may now be based on quite tangible evidence and in dealing with obstreperous parents, such an objective record as that from a psychological examination is very effective in supporting the position taken by the university, especially when it is accompanied by other measures, all of which point to the same decision.

The psychological records have been prepared for 143 students during the past two years and it is impossible to enumerate all the uses to which they have been put. Probably the greatest utility has centered around the delinquents. The question that most often perplexes the educator is "Why does this student fail"? To answer this question it is necessary to utilize all the facts that can be secured, and the results of psychological examinations, when technique is suitably developed, will constitute a vital part of this information. A few typical cases will be described showing how the tests are used in conjunction with other data of a social and economic nature.

Case A

This student came to the university with high recommendations and proceeded on the whole to justify them, making an exceptionally good record during his Freshman year. Of the forty students in the experimental group he ranked fourth in academic standing and third in the psychological tests. In his Sophomore year, however, his academic record was considerably

poorer. From all the evidence it appeared that he was working just as earnestly as during the preceding year. He had joined a fraternity but its influence was not derogatory so far as could be determined. A psychological reason for the inferior quality of his Sophomore work was suggested by an analysis of his psychological record and reports from his instructors. The analysis showed that so long as this student was studying subjects requiring the exercise of rote memory he encountered no difficulty for in this respect he possessed great ability. Freshman subjects favor this ability but in Sophomore subjects the student is encouraged to place less and less reliance upon it and to give more prominence to selective thinking. When this student was plunged into such conditions he found himself singularly inefficient. Instructors attributed his low grades to a lack of ability to carry out lines of thought involving selective thinking; the student remarked upon the same difficulty. All the evidence gave a reasonable hypothesis for the explanation of the discrepancy between the work of the two years. Special attention is being given to the development of the phase in which he is deficient.

Case B

This young lady came to the university with high recommendations and quite a fund of practical experience. All reports showed her to possess an exceptionally high grade of mental ability, and in the psychological tests she ranked first by a very high margin. In academic work, however, it was found that at the end of her Freshman year she ranked eleventh in the list of forty. Examination of this student from the all-round view afforded by the system of administration in operation showed that she was obliged to earn her own living and that she had been spending on the average five and six hours a day in outside work. During one quarter she spent forty-eight hours a week in outside work (though part of it was light), and carried regular university work (fifteen hours). In addition to this she devoted some time to student organizations. In this case the tests together with the other machinery of the system gave the basis for a more exact

estimate of ability than could be secured by observation of classroom work.

Case C

This young lady ranked last in the tests and thirtieth in academic standing in the group of forty. Her university instructors reported her lacking in mental power. At the end of the Freshman year she stood two points below the minimum standard set by the university and undertook the Sophomore work on a decidedly probationary basis. Her efforts were quite beyond reproach so far as earnestness of purpose and intensity of effort were concerned. Social and economic conditions were favorable to good work. The conclusion seemed forced that the difficulty was simply inaptitude for study. The story told by the psychological test was corroborated by all other evidence procurable and her withdrawal from the university seemed eminently justified.

Case D

This young man appeared from his recommendations to have distinctly more than average ability. In the psychological tests he ranked 14.5 among forty individuals. In academic record, however, he ranked thirty-fourth. Investigation along the lines of the office routine showed that he was concentrating only a small fraction of his attention upon academic things. He was popular among his fellows and participated excessively in extra-curriculum activities. His record was good enough to meet the minimum requirements of the university but it was decided to bring pressure upon him in accordance with the policy to demand from every one according to his ability. The hypothesis was that this individual had more ability than he was manifesting in university work. Accordingly the whole matter was laid before him in words somewhat as follows: "All the evidence that can be gathered concerning you points to the conclusion that you are capable of doing much better work than you are now doing. The question now at issue is the question of your return next year. Frankly it seems unwise for you to return next year. If

your environment here is such as to lead to the sort of record which you made last year it would seem wise to change the environment. If after thinking the matter over, however, you feel that you wish to return to the institution, it can only be on a probationary basis with the definite understanding that you will not be eligible for participation in outside activities and that your connection with the university may be severed at any time your work proves unsatisfactory. For an entire quarter nothing short of seven grade-points for three majors taken will be accepted as satisfactory."

The student decided to return in the autumn under the above conditions. Under the new régime he secured ten grade-points and in the winter quarter, eight more, with universal reports of improvement. The psychological tests were a powerful argument with this young man in convincing him of his own powers and of the desire of the university to draw out all the possibilities within him.

Case E

This student entered the university on representations from teachers and others that he was at least of average ability. In the psychological tests, however, he ranked thirty-ninth out of forty. Instructors in the university made discouraging reports as to his mental ability. In the effort to give him a better chance his work was cut down from fifteen hours to ten hours a week, still he made only a grade of C (75) in the two remaining courses. All the evidence showed that he was working hard, therefore he was permitted to continue in the university on a probationary basis. He remained throughout the year without improvement and inasmuch as the Sophomore work promised to be even more taxing on his powers he was advised not to return. Thus the hypothesis furnished by the psychological test record was confirmed by a year of university work.

Case F

This student entered the university with statements from high-school instructors which indicated that he was about an

average student with good fundamental moral qualities. The record he made in the psychological tests ranked him thirty-eighth in the list of forty students. In his first quarter of university work he secured but three grade-points and was placed on probation. The work of the next two quarters resulted in a total of only eleven grade-points so he was asked to withdraw. The parents came to the office in a rather belligerent frame of mind and asked on what ground the university took its stand. The information that had been gathered was laid before them and the parents were considerably enlightened when shown this many-sided view of their son. They departed with a better understanding of the youth and with confidence in the good intentions of the university.

The foregoing typical cases are representative of a great variety of situations in which the tests were clearly serviceable in adjusting students to their work and in determining the attitude of the university toward them. It is impossible in such brief statements to show the extent to which the psychological records were of service. Especially is this true when as in this report, the effort is made to express everything with extreme moderation. Only one accustomed to deal with the perplexities of university administration can fully appreciate the value of every bit of information about a student.

It is now time to summarize the results of this two years' trial of psychological tests as instruments for university administration. A series of sixteen tests has been employed, carefully chosen in the light of past experience in this field so as to give objective measures of mental ability. Care was taken to select tests that were well adapted on the symptomatic side as well as from the standpoint of economy and efficiency; an arrangement was provided for uniting the various results of the tests into a resultant value which would be a quantitative expression of the standing of an individual. The particular tests employed in this preliminary study lent themselves fairly satisfactorily to the needs of the situation. When gauged by the methods ordinarily applied to such tests they show a fair degree of conformity to

standards of efficiency. The distribution of the measures of the separate tests follow for the most part the normal curve of distribution, likewise the distribution of measures in the combined scores. The results of the tests correlate positively with college grades and to a closer degree, with estimated intelligence. By means of the tests the improvement in certain mental functions during one year of university training was measured. Lastly this psychological measure has been found useful in furnishing hypotheses regarding perplexing cases of students, which when acted upon provided happy solutions in many cases.

The thesis upheld here does not advocate the universal adoption of the particular tests in this series. Their imperfections are numerous and have been freely pointed out. The norms of performance here presented do not aspire to rank as standardized measures. With even a perfect system of tests anything of that nature would be unseemly in view of the limited number of students tested. The figures are offered for the sake of their suggestive value and in the hope that efforts toward refinement of method will be stimulated. The production of a highly developed system of psychological examinations for the scientific study of the college student will require long and painstaking research on the part of many investigators. By way of general remark it might be suggested that the tests of the future should be arranged with reference to the capacities of college students. The extensive use of mental tests with school children has resulted in a tendency toward the use of material and form better adapted to children than to adults. Other needs of a more specific nature have been pointed out throughout the text.

Whatever be the nature of the psychological tests that will be evolved in the future for use in this field, it is the method of utilizing them that is under consideration here. The function of psychological tests as here advocated is to furnish grounds for hypotheses regarding individual students and to supplement and give corroboration to other evidence of an interpretative nature. Such a rôle does not include predictive powers. It demands that the tests be regarded merely as instruments for one kind of measurement. In addition, it demands that the student be scien-

tifically measured in a variety of other relationships—physiological, academic, social and economic. Regarding the nature of the psychological measurement thus achieved, attention is called to the fact that this is not even defined. Emphatically it is not an absolute measure of mental ability. It is only relative—relative to the members of the college group. The present series does not even lay claim to completeness in comprehending the important phases of mental ability, though with the advances of future research such a goal may be approximated.

Such an aim for the application of psychological tests is clearly within the realm of possibility and in accord with the principles of scientific method. To one who has witnessed the application of these methods to the education of a group of able and willing young men and women for two years, it is evident that higher education may look with increasing hopes to psychological laboratories.

CHAPTER VII

Vocational Guidance and the College Student

The prevailing interest in vocational guidance and especially in the application of psychological methods to the problem makes it desirable that the methods hereinbefore described be examined as to their vocational significance.

Since President Eliot's[35] notable appeal for the maintenance of a life-work ideal before the college student, educators have begun to realize that much higher education misses point because of insufficient emphasis upon vocational ideals. Especially is the liberal arts course charged with ineffectiveness because it does not relate itself to the future life-work. Probably one cogent reason for this alleged ineffectiveness is that so many students taking the so-called "academic course" have no vocational aims. Under such circumstances the training given by the college must necessarily be that of a purely formal nature. Not knowing what are to be the conditions surrounding the individual in the future, the college must necessarily forbear relating its service to his life-work.

Granting that the college feels its obligation to consider the student in relation to his life-work it is apparent that it must modify the nature of its ministrations somewhat. If the student comes to the college unidentified with any life-work ideals it is the duty of the institution to help him secure a vision, or to use a morp popular term, to give him vocational guidance. It will be shown before the conclusion of this discussion that true vocational guidance means more than assistance in choosing an occupation; especially does the guidance demand of the college and university transcend this narrow interpretation of the term. Nevertheless, for immediate purposes this narrower standpoint will be taken and it will be seen that the college student is sadly in need of vocational guidance.

[35] Charles W. Eliot, The Value during Education of the Life Career Motive, Proceedings of the Nat. Educ. Assn. 1910. Pp. 133-141.

A few statistics[36] will show in some measure the conditions that exist in representative colleges and universities. An investigation was made by Dean L. C. Marshall among 744 undergraduates at the University of Chicago and 503 undergraduates at Ohio Wesleyan University which showed that of the men studied at the former institution, 74.6 had reached definite decisions and of those at the latter institution, 65.1. Of the women, the corresponding percentages were 64.6 at Chicago and 61.0 at Ohio Wesleyan. In an inquiry made by Dean Frederick P. Keppel of Columbia College among 800 graduates of Dartmouth and Columbia College for the years 1908-09-10, 519 replied, and of this number approximately 14 percent had not made a vocational decision at time of graduation. Of the 493 who had decided at time of the inquiry, 216 or 43.8 percent had decided before entering college and had not changed their minds since. Though figures supporting the statement are not given, it is hardly likely that more than two-thirds of the members of these two groups had definitely decided upon a vocation before entering college.

A similar investigation was made among students in the College of Science, Literature and Arts at the University of Minnesota which showed that 90 percent of the students had chosen a vocation at the time the inquiry was made—during the year 1911-12. Closer inspection of the 90 percent that had decided upon vocations shows that 67 per cent of them had decided while in high school or before. The other third had presumably decided at entrance to the university. This shows that in this particular group at least, more than a third of the students needed the direct aid of a vocational counselor at time of entrance to the university.

Even without these significant figures, probably most educators will agree that one-third of the college students enter college without definite vocational aims and unquestionably need direct vocational advice—advice which the institutions for higher education are not giving. Most of these students are considering various vocations in a perplexed state of mind. This was

[36] These statistics are not available in published form except those gathered by Dean Keppel which appeared in Educ. Rev. Vol. 40, pp. 433-9.

brought out in the studies at The University of Chicago and Ohio Wesleyan University. Of the men who had not yet reached decisions, 88.1 percent at the former institution and 78.4 at the latter institution, were *considering* definite vocations. Stated in another way, at the two institutions, only 3.0 percent and 7.5 percent respectively of the men neither had chosen nor were definitely considering vocations. This shows that the students are facing the problem and are in need of assistance in solving it.

But the need of this one third does not constitute the only justification for the establishment of organized vocational guidance in institutions for higher learning. To confine the process thus is to fail in interpreting its real meaning and the true scope of its need. Close inquiry would reveal that many of those students who have ostensibly chosen a life-work have based their decisions upon very slight knowledge either about the task or their own aptitude for it. Moreover with many of them the determination is by no means final. A very little questioning will bring out their own indecision about the matter. Nor is this unsettled state of mind or this tentativeness of choice a thing to be regretted. On the contrary it is a condition to be expected. As knowledge and experience increase it is natural and healthful that an individual should enlarge his vision and get new aspirations. However, in order to allow for these natural evolutions, the college should provide some means for guiding these aspirations. Granting that these two classes of students would be benefited by systematic vocational advice, one can see that even the remaining students who have hypothetically chosen vocations wisely and finally, need the services of a vocational counselor. With them, the advice will be directed toward a proper use of the curriculum, and this suggests the form which vocational guidance should assume in the college—the form of educational guidance. A proper introduction to the curriculum in itself constitutes real vocational guidance, for it will be based primarily upon the student's needs and capacities. It will call out all his resources and will seek compensations for his shortcomings.

Efficient guidance of students through college and university

requires first of all a flexible curriculum. This does not mean a wide-open system of electives; any abuse of that nature would be avoided by the second requirement that the course of every student be determined by an educational expert. The ordinary college student is incapable of merely choosing his own course. It must be done for him. There must be certain principles governing this selection of courses; a prefunctory signing of admission cards is by no means educational guidance. The selection must be made by one who has at his disposal a vast amount of information about the student. Information must be gathered that will show the capacities, the limitations and the past and present environment of the student, all of which must be related to the curriculum. This involves, as is readily seen, the kind of study described in the preceding chapters—the study that considers the student in all his relationships before presuming to shape his future.

Such a study of the individual conforms to the practices that should characterize true vocational guidance. The individual must be studied from all aspects—first physiologically. This should not stop with an examination of the single individual. His descent should be inquired into. Methods are being evolved in biological research for the prosecution of such inquiries and there is probability that considerable light may be thrown upon the powers of an individual from a study of his heredity. Psychological considerations come next, and it is around this phase of vocational guidance that some of the more picturesque and misleading notions cluster. Some of these will be discussed shortly. The social and economic status of the individual next demand careful consideration, and lastly, his interests should be examined. These lines of inquiry seem to comprehend the different factors which, combined, enter into the rationale of vocational guidance. It is possible that future developments will disclose other important relationships. In a concept that is so vaguely defined, and in a social order so volatile as the present, it is difficult to foresee all the complications that may arise. The thing to remember, however, is that vocational adjustment is never a matter for settlement along any one line.

Plans along the lines just indicated are being discussed with more or less clearness throughout the country and interest in the new ideal of vocational guidance is being rapidly aroused. It is forcing itself upon the attention of various classes of society—upon a misfitted and dissatisfied public who sees in it a possible solution of its individual vocational problems, upon industry which sees in it possible amelioration of numerous economic ills, and upon education which sees in it a means for the fulfilment of its highest responsibility, the fitting of the individual to cope with his environment.

As already indicated the ideas held regarding vocational guidance are quite various. People seem to be vaguely groping toward a working notion about it. On some points the way is clear. All see that vocational guidance has an informative function, that it requires the compilation of a large number of facts about occupations so that vocations may be chosen intelligent. Regarding the analysis of the individual, however, there is less clarity. The views that are held are extremely vague, and much is held that is erroneous. The fallacious assumptions involved should be pointed out if progress is to be made.

Perhaps the most serious error in the current notion of vocational guidance is indicated by the assumption that every individual is either "round" or "square"; that each individual is unalterably fitted for one kind of work but not fitted for any other kind. This mischievous doctrine must be overthrown before advance can be made in this field. Its refutation lies in the simple fact that many people can be trained to do several things equally well. In any group of individuals whose abilities are arranged according to the normal curve of distribution there are a few persons at the upper extreme who fall readily into the class of genius, and the line of their success is quite plainly indicated. There are a correspondingly small number of persons at the lower extreme whose deficiencies are so apparent that their vocational possibilities are likewise clearly limited. Between these extremes, however, are a large number—approximately 50%—who could be trained to do several things equally well. This makes it difficult to believe that an individual can rightly hold but one kind of position in the world of work.

A second misunderstanding concerns the use of psychological tests in vocational guidance.[37] In the popular mind this involves putting a person through a prescribed set of tests at perhaps one hour's sitting, and at the end concluding, "You should be a civil engineer," or something equally definite. In order to see the difficulties involved in such an expectation, some of the difficulties of all measurement should be pointed out. In the first place any single measurement must take into account the fact that power of achievement varies from day to day according to changes in weather, physiological and emotional conditions. This vitiates somewhat the reliability of single measurements, and any system of vocational tests that claims validity must make allowance for it. Furthermore, a single measurement will not show susceptibility to improvement. It cannot be ascertained from the results of a single test, to what extent an individual is capable of profiting by practice. Not only does the individual improve beyond the limits of his first attainments in a task, but also the degrees of improvability vary among individuals, and the arrangement of a preliminary series of measures does not bear a constant ratio to measures in successive trials. This is evidenced in widely different types of activity from simple processes to complex acts such as type-writing. It is evident, then, that any system of vocational tests that is to be reliable must guard against errors due to chance sampling and must provide for susceptibility to improvement. These objections do not constitute an insurmountable obstacle, since with sufficient research, it may be possible to devise a method whereby these factors may be weighted. Nevertheless they should be kept in mind as possible sources of error, and they emphasize the possibility that the vocational tests of the future may be more elaborate than at present supposed.

In the light of the foregoing it is apparent that if progress is to be made in vocational guidance it will be necessary to rid the mind of a belief in types, such as executive type, etc. The treacherousness of the type as a scientific concept has been repeatedly demonstrated by experiment, and as a vocational con-

[37] H. D. Kitson, Psychological Tests in Vocational Guidance. School Review, March, 1916. Pp. 207-14.

cept it falls down completely before the simple circumstance that many persons can be trained to do several things equally well.

It is frequently advocated that interest should be the ultimate criterion in giving vocational advice.[38] Various methods have been proposed for discovering interests. Questionnaires have been prepared in profusion, and various methods of studying expressions have been proposed such as studying involuntary reactions to various kinds of interesting stimuli. The great difficulty in being guided by interests is that many individuals possess a number of them, often of equal strength and of a conflicting nature. Furthermore they vary from time to time, especially during adolescent years. These individuals constitute the most difficult problem for vocational guidance and they can receive little help from a doctrine that uses interest as its chief criterion of aptitude.

The foregoing discussion points out some of the chief difficulties on the technical side that becloud the current notion about vocational guidance, and suggests the psychological reasons for its rejection or at least, modification. There are further considerations of a philosophical import that demand its revision. In the first place it maintains implicitly that in the grand cosmic scheme there is but one task that can be satisfactorily performed by a single individual; that the nature of this task is prearranged by the constitution of his psycho-physical organism, his social and economic milieu, etc. While this doctrine can not be completely invalidated on logical grounds, it is at least seriously open to question and should be carefully weighed before incorporating it into any concept so momentous as that of vocational guidance. According to this doctrine, the failures made by misfits are due to the fact that they did not find the right avenue for their talents. It implies that if a man finds his niche, success is assured; his efforts will always be in proportion to his stimulus and he is a mere puppet in the hands of fate. This doctrine, while embracing the conception of a beautifully well-ordered and harmonious universe, leaves out of account the factor of personal volition. It

[38] H. D. Kitson, Interest as a Criterion in Vocational Guidance. Educ. Rev. Nov. 1916, pp. 349-56.

tacitly assumes that if the methods of science be sufficiently refined one will be able to foretell with practical certainty the destiny of an individual. Such a program is feasible in astronomy where the course of fixed and soulless stars is concerned, but in the realm of human endeavor it is not likely to be of much avail as a working hypothesis. There is a further consideration that will have weight with all except those who are inalienably committed to a mechanistic conception of the universe. The current doctrine fails to make allowance for contingencies beyond the control of the individual. It displays a cock-sureness about the future that is not warranted by the course of human experience. The experience of every one will show occurrences which, even with the utmost care, could not have been provided for in advance. Whether one attributes these to Chance or to the "divinity that shapes our ends," they are a part of the universe and must be reckoned with. The glaring fault of the present doctrine may be said to be that it views the individual and society as two static entities. It says, "This youth should be a civil engineer," and looks upon him as one who should devote his entire life to that profession. Now as a matter of fact the individuals, and successful ones, too, who spend their lives in an unchanged line of work are not so numerous as one thinks. The individual constantly changes. He develops new interests, and when placed in new positions, frequently displays talents whose presence was previously unsuspected. Thus the civil engineer might by stress of circumstances develop into an excellent executive and lay aside his engineering duties. Still another person might reach that same executive position through an avenue other than that of the engineer. He might reach it through the sales avenue. There is considerable illumination to be thrown upon these problems by applying the concept of evolution to the vocational develment of individuals, and in the careers of successful men it is quite easy to mark the stages of that evolutionary process, and to note how each change took advantage of the experience of former stages. But to suppose that science could foresee the course of that development and foretell its progress exactly were to place too great a strain upon the potentialities of scientific method and upon man's credulity.

Just as the relations of the individual should be regarded as dynamic in their nature, so also should society be regarded as dynamic. The kinds of work which the world requires are in constant change. Examples abound. For example, twenty years ago there were no such vocations as those of chauffer, aviator, etc. Twenty years hence there will be other new ones. The hide-bound method of assigning vocations would make no allowance for these developments, and hence breaks down.

It is admitted that all of these objectionable doctrines are not explicitly asserted as essential parts of vocational guidance as it is advocated by many persons, nevertheless it is apparent that the prevailing opinion is surely leaning in the directions mentioned. These criticisms are offered before the concept becomes crystallized in the hope that as it grows it will develop along healthy lines and not along lines that will bring it into discredit. In attempting to derive a formula that will stand the test of logic and experience, it seems necessary to regard the service of vocational guidance as chiefly *monitory* in character. It should eschew all pretensions to predictive power. It may properly only marshal facts and show to the individual the tendencies within himself. Given a wealth of information about occupations and accurate measurements of the individual in all his phases, one can only say at most: "If you enter this particular vocation you will be hampered in this or that respect and you will have this much in your favor. If you have sufficient determination you may rise above the handicaps and attain to some degree of success in the calling. Science, however, cannot place a tag upon you that will guarantee a safe journey over the road of least resistance to a goal of gratified ambition and unalloyed success."

Such an ideal as that just suggested, while not possessing the dramatic possibilities of the more picturesque "pigeon-hole" point of view, nevertheless seems more becoming as a working hypothesis. In the first place it recognizes the fact that the individual and society are in a dynamic state of interplay, not static. Second, it calls for nothing not within the range of scientific method. It is quite possible to conceive of a technique

that will enable one to give pointed advice without postulating any mysterious prescience. One who follows such an ideal will be free from the suspicion of charlatanism that might be urged against those who in order to tickle the ears of a credulous public, would make promises beyond the power of science to fulfill. This more modest ideal is also free from the errors of a fatalistic philosophy. It postulates no hypothetical "best way." It simply takes facts as it finds them and draws conclusions based on facts alone. One is forced to conclude that the former will never lead to a scientific attitude, while the latter adheres to scientific method. A further advantage that enhances the attractiveness of this *monitory* type of vocational guidance is that it relieves one individual from responsibility for another's successes or failures. A man of scientific mind revolts from the task of issuing ultimate fiats regarding the future such as are popularly demanded. Advice he will gladly give. Scientific measurements he will cheerfully make. Interpretation of these measures is his bounden duty. Further than this he can not go, and society should not ask more.

The evidence points to the untenability of the "pigeon-hole" theories of vocational guidance and to the adoption of a *monitory* theory. The relinquishment of the more pretentious ideal does not signify, however, that educators should lessen their zeal in the matter. On the contrary the adoption of this *monitory* conception should accelerate the progress of true vocational guidance. Society does not possess an elaborate technique for probing into the future but she does have abundant material for applying the fundamental principles of vocational guidance which consist in studying the individual in all his relationships. The informative function of vocational guidance can be partially performed by a proper utilization of census reports. Figures are compiled showing the distribution of different kinds of workers throughout the country, and these figures may be related to a number of other facts of distinct vocational significance, such as proportion to population, productivity of soil, climatic conditions, rate of mortality, scale of wages, etc. These statistics are available and only await their application to take a prominent place in the preparation of youth for vocations.

By way of analysis of the individual, there are methods available that might render excellent service if properly applied. Every institution that addresses itself to the preparation of men and women for life may take some steps toward vocational guidance. Ofttimes a bit of kindly advice from some member of the faculty who is not afraid to tell the truth, would save one from a misstep. But in addition, there should be one whose duty it is to secure all possible information about the student, academic, psychological, physiological, social and economic. On the basis of this many-sided view, many strengths and weaknesses will be brought out. The next step is to utilize the curriculum for the development within the student of those qualities which are needed for his success. Perhaps the college curriculum will have to be seriously modified in order to be thus used. Indeed, it is very likely that such will be the case. Not the least of the beneficial results from the movement of vocational guidance among colleges will be efforts to rationalize the curriculum and link it up more completely with the needs of society. All the benefits to be derived from organized vocational guidance can not be enumerated, but enough has been said to show that the educational institutions of the country would find it one of their most powerful agencies for the development of the individual to his highest capacity, and for the utilization of his powers by society.